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# ASTEROID HYALITIS

## REPORT OF A CASE WITH MICROCHEMICAL AND HISTOLOGIC OBSERVATIONS *

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Under the name of asteroid hyalitis, Benson,[1] in 1894, described peculiar bodies found in the vitreous and gave them this title because of their resemblance to the stars on a clear night. In this country the same condition has probably been more accurately described, and the differentiation of the bodies present from those of synchysis scintillans emphasized, under the name of snowball opacities of the vitreous. These same bodies have been described by Bachstez[2] under the title scintillatio corporis vitrei. The present report concerns the microchemical and histologic examination of an eye containing these snowball opacities associated with chronic glaucoma.

There have been numerous clinical reports of these cases, and Vogt included a slit-lamp description of them in his atlas. A report of an examination of these snowball opacities in an effort to determine their nature was made by Lauber,[3] but he came to no definite conclusion as to their chemical constitution. Verhoeff,[4] in 1921, made a complete histologic and microchemical examination in a case which was recognized one and a half years previously and in which the eye was enucleated because of hemorrhagic glaucoma. He concluded that "the balls consisted chiefly of a calcium soap, probably calcium margarat, possibly admixed with insoluble compounds of cholesterol and lecithin." In his case the retinal circulation was practically abolished, and there was marked sclerosis of the choroidal arteries. He suggested that angio-

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1. Benson: Tr. Ophth. Soc. U. Kingdom **14**:101, 1894.

2. Bachstez: Wien. med. Wchnschr. **71**:1044, 1921; Ztschr. f. Augenh. **54**: 36, 1924.

3. Lauber, quoted by Bachstez (footnote 2).

4. Verhoeff, F. H.: Am. J. Ophth. **4**:155, 1921.

sclerosis of the intra-ocular vessels was important in the etiology of the opacities. In the same year, Bachstez reported under the name scintillatio corporis vitrei the chemical examination of two eyes from two patients. He concluded that the opacities consisted of fatty acid and lime, the fatty acid being either palmitic or stearic acid. Bachstez again, in 1924, gave a report concerning four eyes in three cases with these same opacities. The observations on two of the eyes had been reported previously. In his second report, he included a histologic examination in two instances. He failed to find angiosclerosis of the retinal or of the choroidal vessels.

## REPORT OF CASE

*History.*—J. V., aged 69, was admitted to the University Hospital on Feb. 4, 1929, with a history of having no subjective difficulty with his eyes, except for the necessity of wearing glasses, until two weeks prior to admission. At that

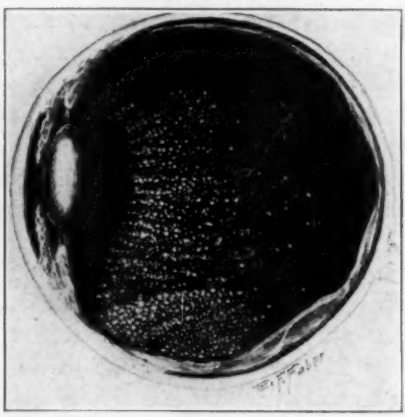

Fig. 1.—Vertical section of the globe, showing the column-like arrangement of the opacities.

time, blurred vision of the right eye developed and two days later symptoms of acute glaucoma. He was treated with miotics at another hospital with relief from pain.

*Examination.*—At the time of admission, the vision in the right eye was reduced to counting fingers at 6 inches, and in the left eye to 6/12. The right eye was diffusely injected, the cornea steamy, the anterior chamber shallow and the pupil moderately dilated. There were a few fine lenticular opacities. The vitreous was studded with numerous sharply defined, white spheres of varying size, which moved but slightly with rotations of the eye. These could be seen with oblique illumination as well as with the ophthalmoscope. There were a number of thread-like vitreous opacities. The disk was atrophic and had a deep glaucomatous cup. There was a marked arterial pulse. The left eye was normal externally. The media were clear, the disk was healthy in color and outline and the retinal vessels were slightly sclerotic. There were no lesions of the retina or choroid.

*Operation.*—A corneoscleral trephine was done on the right eye by Dr. Fewell. Six days later the patient developed an attack of acute cardiac dilatation. Roentgen

examination at that time revealed an old tuberculous lesion at each pulmonary apex. Twelve days after this the patient died of coronary thrombosis and bronchopneumonia.

The eye was enucleated one hour after the death of the patient, and the globe was fixed in a diluted solution of formaldehyde, U. S. P. (1:10). After fixation, the globe was divided vertically. The part containing the optic nerve and trephine opening was prepared and embedded in celloidin, and sections were cut. The vitreous of the other half, with the contained spheres, was subjected to the various tests detailed.

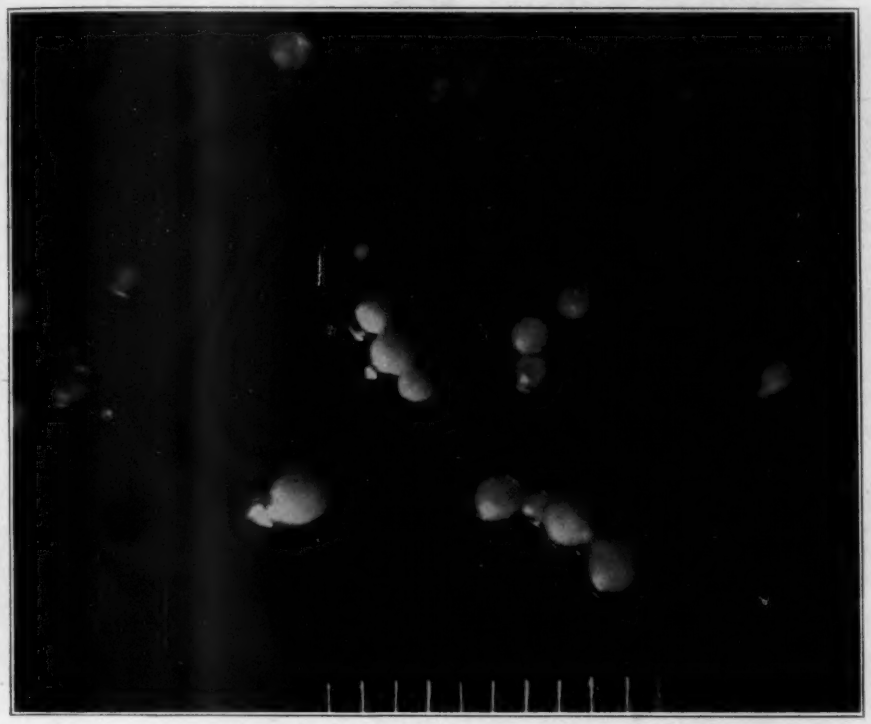

Fig. 2.—The snowball opacities as seen by reflected light. Each scale division equals 0.05 mm.

*Histologic Report.*—The globe was normal in size and contour. The anteroposterior and vertical diameters were 24 mm., the horizontal diameter, 25 mm. The cornea was hazy and measured 11 by 12 mm. On the upper limbus was a corneoscleral trephine opening, and beneath this was a coloboma caused by a basal iridectomy that did not include the sphincter. The lens, iris, ciliary body and retina maintained their normal relationships.

The corneal epithelium was everywhere intact and was uniform. Bowman's membrane and the corneal stroma were normal, except for some separation of the fiber bundles of the latter due to fixation. Descemet's membrane and the endothelium were unbroken. There was no exudate or hemorrhage in the anterior chamber. The iris angle was narrowed on either side, but the base of the iris

was not adherent to the posterior corneal surface. The iris was thickened, with wide tissue spaces and dilated vessels. There was no ectropion of the uveae. On one side the opening made by the iridectomy was seen. At the site of the trephine opening, the ciliary body was flattened and a ciliary process was pulled forward and was adherent within the opening. At several places, areas of iris pigment were seen attached to the anterior lens capsule. The ciliary body and ciliary processes were not atrophic, and, with the exception noted, presented their usual appearance. Beneath the choroid on either side of the globe and extending from a position behind the ciliary body to the equator was a uniform, homogeneous, noncellular exudate. Slightly further posterior on one side was a small subchoroidal hemorrhage. The choroid was thin, and the layer of larger vessels was

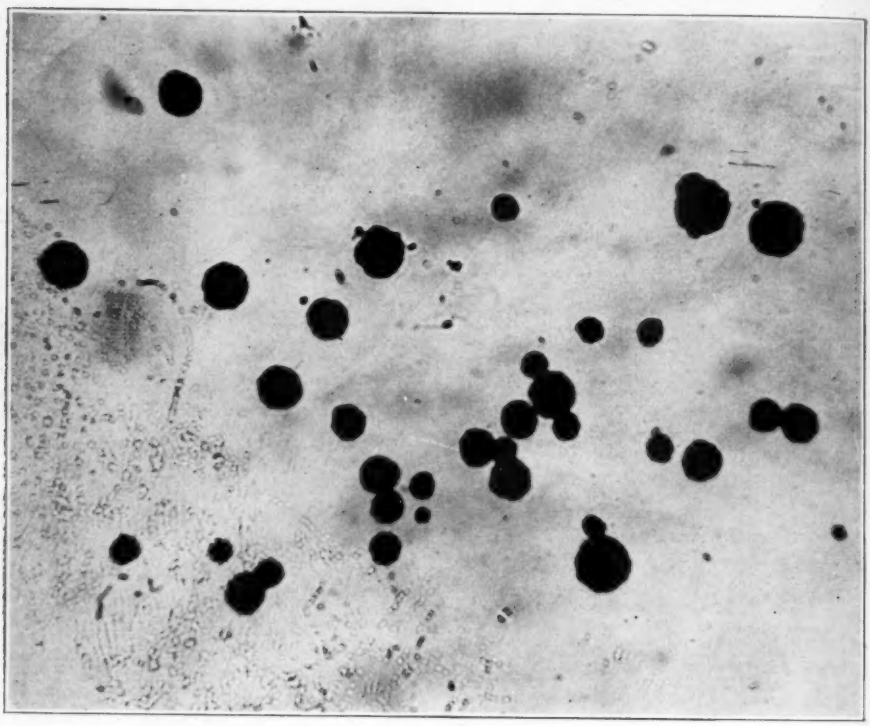

Fig. 3.—The snowball opacities as seen by transmitted light.

filled with blood cells only in the posterior portion. At several places in the anterior portion there were slightly raised, uniformly staining areas just beneath the pigment epithelium. The choroidal vessels did not show angiosclerosis. The retina was detached through fixation, and the anterior portion showed well marked cystic degeneration. The layer of rods and cones had degenerated. The internal and external nuclear layers stained well, and the ganglion cell layer was present. The retinal vessels did not show sclerosis. There was a deep glaucomatous type of cupping of the optic papilla, and the nerve was atrophic.

The vitreous was normal in consistency and was grossly clear except for the contained spherical white opacities. These were found throughout the whole of

the vitreous humor, but they were much more numerous in the anterior two-thirds. They were densest in the lower part of the globe. None was seen in contact with the retina, the ciliary body or the posterior surface of the lens. There was none in the anterior chamber. The greater number of the larger spheres were in the central and posterior portions of the vitreous cavity. Many of the spheres formed a column-like arrangement, beginning just anterior and slightly internal to the ora serrata and curving in a slight arc inward and backward for a distance of from 6 to 8 mm., when the arrangement became more irregular. They frequently occurred in groups of two or three larger spheres surrounded by a number of smaller ones.

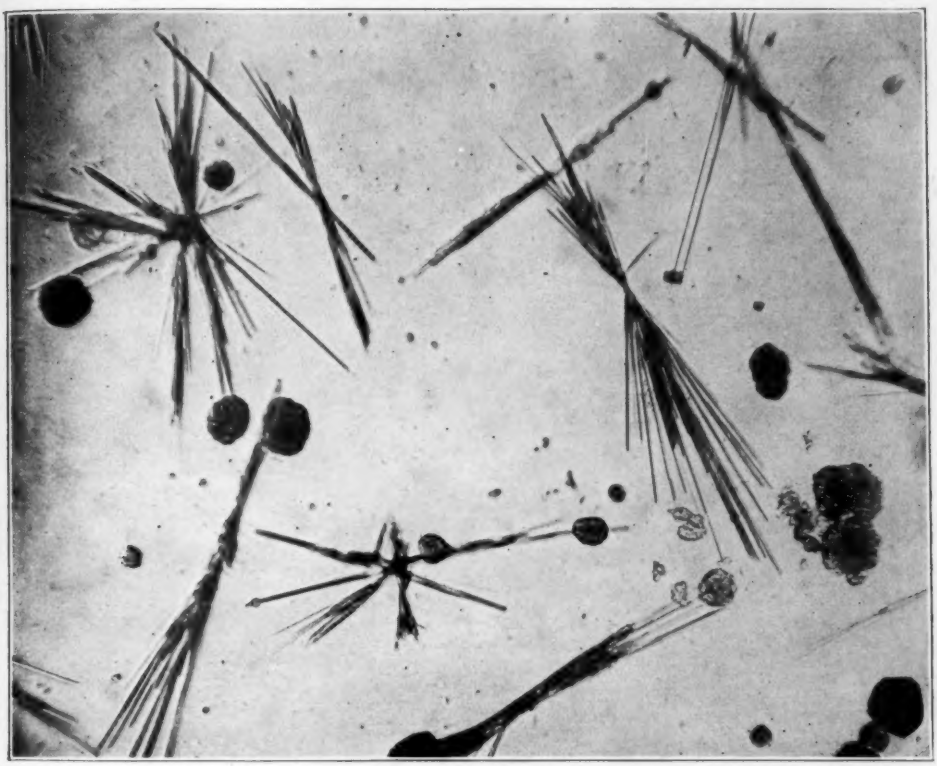

Fig. 4.—Crystals formed after treating a small amount of vitreous containing the opacities with concentrated sulphuric acid. They were insoluble in 70 per cent alcohol.

The spheres were easily seen in unstained celloidin sections mounted in glycerin. They were faintly seen in hematoxylin-eosin preparations, in which they appeared to be caught in delicate fibrils that passed to either side of them. They were best seen in the undried vitreous under a cover-glass on a slide. By transmitted light they appeared nearly black and by reflected light as snow white spheres. They measured from 0.08 to less than 0.01 mm. in diameter. They were almost spherical, with a sharp outline, and under high magnification they had a slightly granular surface and a finely serrated margin. Occasionally, a

larger sphere had a smaller one resting on it like a cap. At times, especially after treatment with dilute acid, a large sphere appeared to contain several smaller ones. They were firm enough to resist crushing between slides and were sufficiently resistant to heat that the vitreous was charred before their appearance was altered.

*Microchemical Tests.*—The spheres were insoluble in alcohol, ether, acetone, glycerin, glacial acetic acid, ammonium hydroxide and 30 per cent potassium hydroxide. They were insoluble in concentrated hydrochloric acid, but became much less opaque. With concentrated sulphuric acid, they became transparent except for their margins and became invisible to reflected light, but they were not

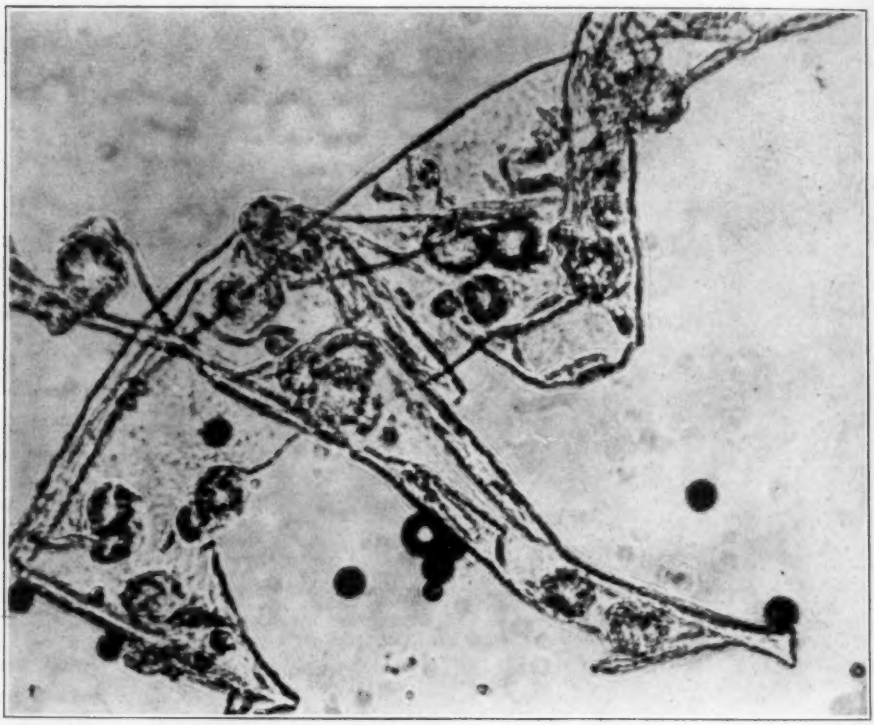

Fig. 5.—Gas bubbles formed after treatment of the opacities with concentrated acids.

completely soluble. With concentrated nitric acid their appearance was altered as with sulphuric acid, but after the lapse of from six to eight hours they completely dissolved. When treated with chloroform they became transparent, except for their margins and lost their snow white appearance to reflected light, but after drying, the greater part of their former appearance returned. Xylene produced the same changes.

When a small amount of dried vitreous was treated with concentrated nitric, sulphuric or hydrochloric acid, numerous gas bubbles were evolved. When treated with sulphuric acid, numerous needle-like crystals, in bundles and sheaves, were formed. These crystals were insoluble in 70 per cent alcohol.

Examination with the crossed nicol prisms failed to show double refraction. Examination after treatment with concentrated acids or 30 per cent potassium hydroxide also failed to show double refraction. After the application of 10 per cent hydrochloric, sulphuric or nitric acid, however, double refractility was marked.

The spheres stained well in fifteen or twenty minutes with scharlach r or sudan III. They took a light blue stain with nile blue sulphate. One per cent osmic acid for forty-eight hours gave a light brownish stain. After the spheres were treated with concentrated nitric acid and then stained with scharlach r, they stained but faintly, while there were globules in the vicinity that stained deeply.

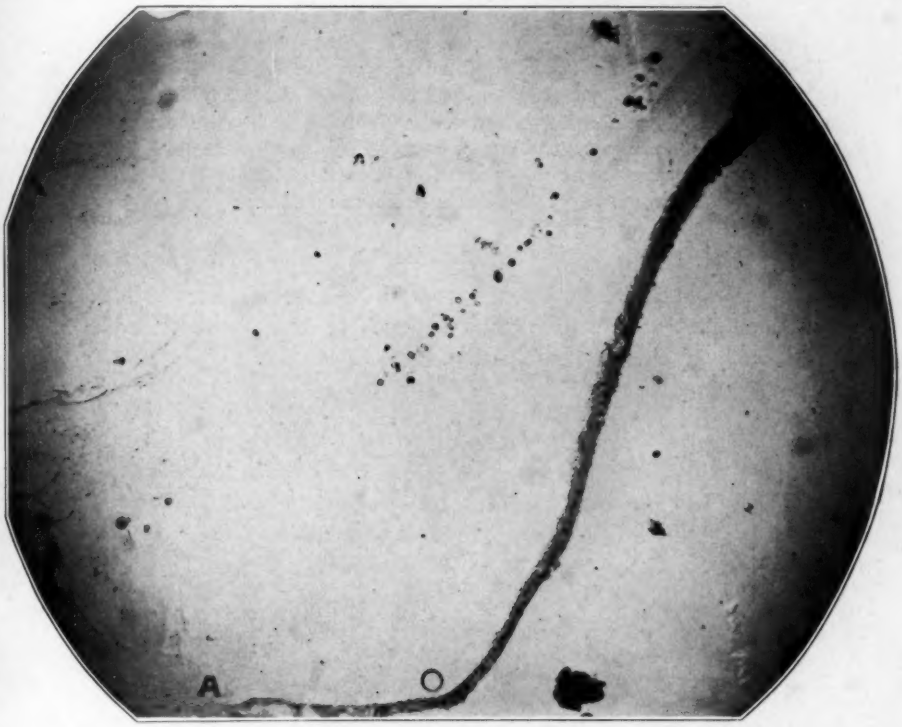


Fig. 6.—Unstained celloidin section mounted in glycerin, showing the column-like arrangement of the opacities. *A*, the anterior extremity of the retina.

The Salkowski and the iodine and sulphuric acid tests for cholesterol gave negative results. When a drop of nitric acid and then a drop of ammonium molybdate were added to some of the spheres dried on a slide and the slide warmed gently, there was a scant precipitate of small yellowish crystals. These were no more numerous than when the same test was applied to a small amount of dried vitreous from a normal eye. The amyloid reaction with compound solution of iodine was negative, and there was no staining with copper acetate solution or with a 2 per cent silver nitrate solution. Millon's and the murexid tests gave negative results.

The spheres in the dried vitreous stained slightly with alum-hematoxylin solution, acid hemalum and with Verhoeff's elastic tissue stain. With eosin,

phosphotungstic-acid hematoxylin and picrofuchsin there was no staining. When treated in sections, there was a slight stain wtih alum-hematoxylin solution, with Verhoeff's and Weigert's elastic tissue stain and with potassium permanganate. There was no staining with Gram's method, acid fuchsin, borax-carmine, van Gieson's stain, methylene aniline blue or phosphotungstic-acid hematoxylin.

Because of the small amount of material available, the chemical tests that could be applied were not so conclusive as one would wish. The formation of a large number of gas bubbles of carbon dioxide on treatment with strong acids indicated the presence of a carbonate. The scant precipitate formed with the nitric acid, ammonium molybdate test and the lack of staining with silver nitrate in the presence of chlorides showed that phosphate which may be present is in no greater amount than in normal vitreous. The formation of typical crystals of calcium sulphate, insoluble in 70 per cent alcohol, indicated the presence of calcium.

The staining with scharlach r indicated the presence of a fat, and the poor staining with osmic acid, the lack of oleic acid or an oleate. The fat present, therefore, is either a palmitate or a stearate, or both. Free lipoids were excluded by the lack of double refraction. The presence of lipoid in combination is indicated by the double refraction after treatment with dilute acids. The light blue stain with nile blue sulphate is suggestive of the presence of a soap.

## CONCLUSION

We may conclude, therefore, from these foregoing tests that the spheres contain a carbonate, calcium, a stearate or a palmitate, or both, and probably lipoids in combination.

# THE EYE IN DIABETES MELLITUS*

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The ocular lesions complicating diabetes are varied and occur in from 20 to 30 per cent of the cases.

Diabetes is a disease mainly of middle life, occurring at a time when arteriosclerosis is apt to be present. The complications of the eye, however, usually occur only after the disease has progressed for from five to ten years or more, when the patient is debilitated and consequently is more susceptible to infections, or has become a victim to various chronic disorders, such as essential hypertension, nephritis, syphilis, tuberculosis and poisoning with alcohol or tobacco. These diseases may exist in diabetic persons independently of the disease.

Retinitis is the most frequent lesion of the eye associated with diabetes. The other diseases of the eye which more rarely accompany diabetes are cataract, chronic retrobulbar neuritis, muscular disorders, disturbances of accommodation, refraction and iritis. These conditions also may exist independently of the diabetes. Such lesions as thrombosis of the retinal veins, with or without hemorrhages, proliferating retinitis and secondary glaucoma, which are recorded as the result of diabetes, as a matter of fact rarely occur during its course. They are of vascular origin and exist coincidentally with the diabetes. In young adults suffering from grave diabetes with lipemia and coma, the condition of the eye is known as lipemia retinalis. This is the only lesion of the fundus which may be considered as pathognomonic of diabetes. Children rarely show any complications of the eye in this disease.

Many causes may lead to ocular lesions in diabetes. It is known that abnormal carbohydrate metabolism, the cause of which is obscure, produces an increased blood sugar or hyperglycemia, and this altered blood state may act as a toxin affecting some of the ocular structures. It is also known that this blood sugar invades the ocular circulation and from there, due to physicochemical conditions, it enters the surrounding tissues, ocular fluids and the lens.

In a paper presented before the American Ophthalmological Society in 1927, by Dr. Killian, Miss Kamner and myself, we reported our observations on hyperglycemia experimentally produced in dogs and rabbits. We showed that after intravenous injections of dextrose, the sugar of the ocular fluids rises, paralleling that of the blood sugar; that during recovery from this hyperglycemia the decrease in ocular fluid sugar lags

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behind the drop in blood sugar; also that phosphorus poisoning produces a marked decrease in the ocular fluid sugar and that insulin decreases the sugar of the ocular fluids. Changes in the lactic acid of the ocular fluids after the administration of insulin suggest that the metabolism of carbohydrates may take place within the eye. The concentration of the sugar of the ocular fluid shows a dependence on that of the blood similar to that observed in the cerebrospinal fluid.

In examination of the fundus in some cases, the pupils cannot be fully dilated owing to muscular weakness of the iris caused primarily by sclerosis of the arterioles affecting the general nutrition of the eyes. The fundus picture of diabetic retinitis is frequently difficult or impossible to differentiate from that of renal and arteriosclerotic retinitis, owing to the primary vascular pathologic process common to all; therefore a thorough physical examination is essential.

The structure of the eye most frequently involved in diabetes is the retina, primarily its vessels, the most typical example being lipemia retinalis, which involves both eyes and occurs in severe diabetes. About thirty-one cases are reported in the literature.

In 1921, Dr. Killian and I reported a case from the Harlem Hospital occurring in a boy, aged 14, who died forty-eight hours after admission. He entered in coma and had a marked hypotony due to dehydration of the tissue of both eyeballs. The blood picture was typical of diabetes with acidosis. Fat and cholesterol were markedly increased. Soon after death the examination of the aqueous and vitreous of both eyes showed an increase of fat. All the retinal blood vessels were moderately dilated and had a milky appearance. This milky appearance is due to the lower specific gravity of the lipoid material in plasma adhering to the edge of the lumen of the vessels; the red blood cells remain in the center. This appearance was not seen in the visible choroidal vessels, probably owing to the marked anastomosis of the vessels, which increased the flow of the blood current, thus promoting the mixture of the red cells with the lipoid material. This appearance of the fundus alone, exclusive of any examination of blood or urine, determines the diagnosis of diabetes. There is no other disease or fundus picture with which it can be confused. Microscopically, the vascular walls were not involved in any of the reported cases. This retinal appearance is present six weeks before the coma. One case was recorded in which the coma disappeared when the patient was placed on a restricted diet, and the patient recovered.

A second case occurred in a man, aged 21, who was observed intermittently from 1921 to 1924 at the Post-Graduate Hospital. He first sought advice at the clinic in 1921 on account of a marked squint. He was admitted to the hospital, and during the routine urinalysis 3 per

cent of sugar was discovered. He refused medical treatment and left the hospital after operation for the squint, but returned a month later with all the characteristic symptoms of diabetes. He was treated and improved when his diet was restricted and insulin (Lilly) was administered; he was then discharged. This history was repeated five times. In September, 1923, he developed a skin eruption which was diagnosed as xanthoma diabeticorum. On Oct. 20, 1924, his vision became markedly disturbed, and he again reentered the hospital. The fundus showed a typical lipemia retinalis. The blood examination revealed: cholesterol, 1.008 mg. per hundred cubic centimeters; blood sugar, 0.536; carbon dioxide, 23.9 mg., and total fat, 11.3 mg. When he was placed on a fat diet and insulin (Lilly) was administered, the vision became apparently normal after forty-eight hours, and the lipemia retinalis disappeared. At present the patient has chronic diabetes, and is employed as an orderly.

It is our impression that the appearance of lipemia retinalis is closely related to the total fat content of the blood rather than to the cholesterol which occurs in nephrosis in which lipemia retinalis is not seen; the latter condition is probably due to the pathologic amount and quality of blood fat in each case.

Diabetic retinitis is usually bilateral. The characteristic appearance consists of normal-looking disks with glistening whitish plaques, sharply outlined and arranged in a circular manner around the macula. These are probably due to a fatty degeneration. There are also a few small, discrete circular hemorrhages located around the macular area. These hemorrhages are probably due to a diapedesis of the red blood cells from the deep terminal capillaries. The retinal vessels frequently show definite pathologic evidence of varying degrees of arteriosclerosis. A general hypertension, if present, is apt to aggravate the lesion of the fundus. Some clinicians claim that hypertension is a forerunner of arteriosclerosis, and that this arteriosclerosis culminates in diabetes.

When diabetic retinitis is complicated by nephritis or arteriosclerosis, the retinal picture is not especially significant of either of those diseases unless that complication is predominant. I believe with others who have studied diabetic retinitis that this lesion is mainly due to sclerosis of the retinal vessels, a condition which may be either mild or severe. Moore classified the retinal vascular lesions into two types, one of which was a mild vascular disturbance recognized by slight alterations in the vessel wall associated with a few small hemorrhages and white foci. Based on demonstrations by myself and others, I believe that in these cases the retinal and choroidal vessels may appear normal, while microscopic examinations in the same cases will show local areas of thickening of the capillaries. When the retinal arteriosclerosis becomes more severe,

inflammatory lesions are present, such as papillitis, exudates, hemorrhages and marked vascular alterations. The condition is then designated by Moore as a severe or advanced type. These two types of vascular disturbance represent the basic pathologic process in the retina in diabetes. The disturbed sugar metabolism is only contributory.

My reasons for this belief are based on the following premises:

1. In diabetes with diabetic retinitis, the thickening of the vascular wall was present microscopically in the retinal blood vessels, although in the same cases, when examined ophthalmoscopically, the eyes appeared normal.

2. The hemorrhages are due to degeneration of the vascular wall, not to hypertension. In many of these cases observed for long periods there was no hypertension, nor was there any venous stasis or cellular disturbance to explain the extravasated blood in the retinal tissues.

3. In a certain number of cases, when the general condition improved under dietetic and insulin treatment, the retinal pathologic process increased, which would indicate the presence of a permanent vascular pathologic condition.

4. In lipemia retinalis, when diabetes in the young is severe, there is present in the blood a marked alteration in the sugar metabolism, and in all case reports in which microscopic examination is included there is mention of the finding of normal blood vessels.

5. Hypertension is frequently associated with diabetes and arteriosclerosis. I have observed two cases of long-standing uncontrollable hypertension in which retinal arteriosclerosis developed. It is possible that the hypertension might have developed or increased the lesions of the vascular wall.

6. Diabetic gangrene is primarily due to arteriosclerosis.

7. The cause of death in diabetes frequently is apoplexy and a hemiplegic lesion, owing to disease of the vascular wall.

8. The retinal arteriosclerosis is a part of the systemic arteriosclerosis.

From these facts I conclude that diabetic retinitis is due mainly to disease of the retinal vessels, and that in some instances diabetes influences the fundus picture in an early stage. I am inclined to consider diabetic retinitis either as a retinal arteriosclerosis in diabetes or, if the vascular lesion is severe, as an arteriosclerotic retinitis in diabetes. The same nomenclature could be applied to nephritis. If both diseases are present, I would refer both to the vascular condition, thus indicating a more definite clinicopathologic entity.

I shall briefly describe two cases, demonstrated with photomicrographs of the pathologic process of the eye.

REPORT OF CASES

CASE 1.—Mrs. E. T., aged 63, a patient at Ward's Island, was admitted to the hospital for psychosis, headaches and dizzy spells of over two years' duration. One year before entrance, she had an apoplectic seizure. On admission, glucosuria was discovered. The blood pressure was 230 systolic and 100 diastolic; a systolic murmur was heard over the heart. The blood sugar was not determined; the blood urea, nitrogen and creatinine were normal.

At autopsy, the gross pathologic examination revealed the following: kidneys weighed 90 Gm. each and were reddish gray, contracted and granular. The heart showed concentric hypertrophy, and the aortic and mitral valves were thickened;

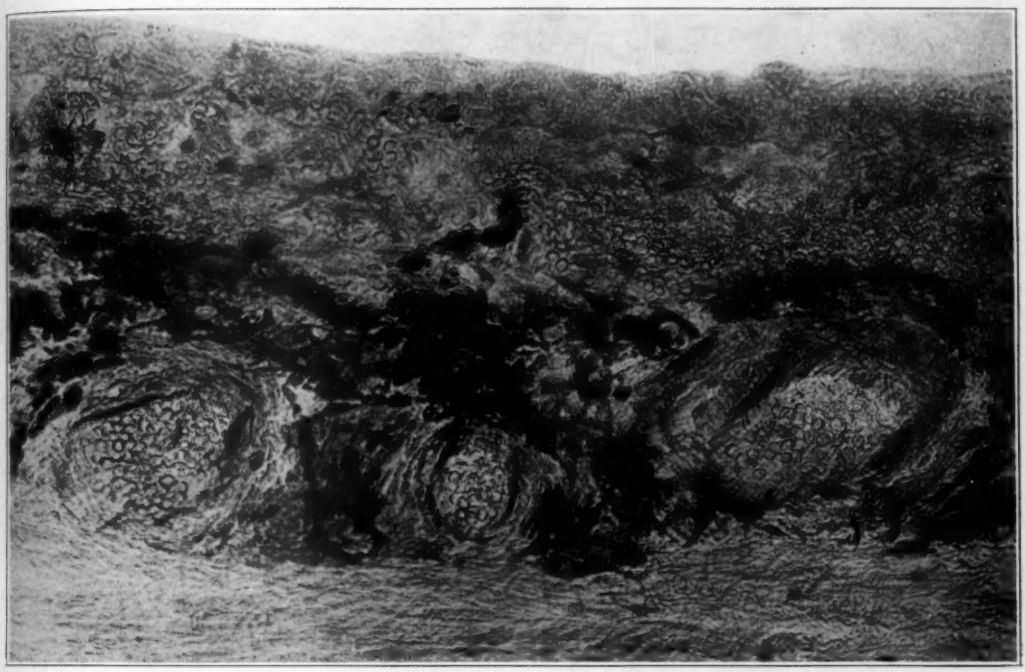

Fig. 1 (case 1).—Three blood vessels in the choroid. The walls are thickened and the lumen narrowed. High power magnification.

the coronary arteries and aorta were atheromatous. Diagnosis based on a microscopic examination of the kidney was: decrescent arteriosclerosis with contraction of the kidney.

Examination of the eye revealed a normal fundus and disk, a few whitish spots around the papilla, a few small circular hemorrhages scattered over the fundus and apparently normal retinal vessels. The diagnosis based on this examination was retinal arteriosclerosis in diabetes.

CASE 2.—Mrs. K. W., a patient at the Harlem Hospital, was admitted for a traumatic ulcer of the right cornea due to a bruise from a comb. This slight injury in two days developed into an ulcer, probably aggravated by the debilitated diabetic condition. This corneal complication is very rare. She was normal

physically, except for obesity and the finding of an enlarged liver and 3 per cent of sugar in the urine. No albumin or casts were present. The blood pressure was not noted.

In the right eye, there was a large purulent corneal ulcer with hypopyon, and marked chemosis of the ocular conjunctiva, with pain and photophobia. The upper lid was congested and swollen. Light perception only was present. The eye was extremely sensitive to palpation. Enucleation was performed.

Vision was normal in the left eye and the results of the external examination were also normal. Examination of the fundus showed a normal papilla; numerous

Fig. 2 (case 1).—Sclerotic blood vessels in the retina. One appears in the ganglion cell layer in the upper portion of the photograph, and six new vessels in the external plexiform layer are shown in the lower portion. High power magnification.

circular hemorrhages and glistening white spots were scattered over the entire fundus. The retinal vessels were apparently normal. Diagnosis based on the examination of the fundus was retinal arteriosclerosis in diabetes.

I recently saw two cases of cataract in young diabetic patients, in both of whom I felt convinced that the cataract had existed since early childhood, but whether diabetes produced or influenced its progress,

I am unable to state. If cataract appears in older diabetic persons, it is probably the usual type of senile cataract complicating diabetes. Microscopically, by slit-lamp examinations and clinically, diabetic cataract cannot be differentiated from senile cataract. Before operating for cataract, one should make blood sugar examinations, and in order to avoid an error in diagnosis the presence of urinary sugar should not be relied on.

On Feb. 15, 1929, Dr. Roger Dennett requested me to examine an infant with the following history:

CASE 3.—A boy, aged 5 months, was first seen by Dr. Dennett on Aug. 8, 1928. He weighed 8 pounds and 15 ounces (4 Kg.) and had a history of having previously had an infectious diarrhea. He was fast becoming exsanguinated because of a large number of bloody stools. The liver was at the level of the umbilicus; the spleen was barely palpable; he was emaciated and small in stature. The heart and lungs were normal and the eyes normal in appearance. A transfusion stopped the hemorrhages within a week; the diarrhea was cured by dietetic treatment. The child gained slowly in weight during the next four and a half months, weighing 10 pounds and 12 ounces (5 Kg.) on January 21. On that date a mild rise in temperature developed, which was attributed to a very red sore throat. Sugar then began to appear in the urine, as much as 1.4 per cent. He was treated with gradually increasing doses of insulin, the maximum dose being 15 units a day, without any disappearance of the sugar. On February 15, the sugar was still 1.4 per cent. His blood sugar was 246 mg. per hundred cubic centimeters. The infant

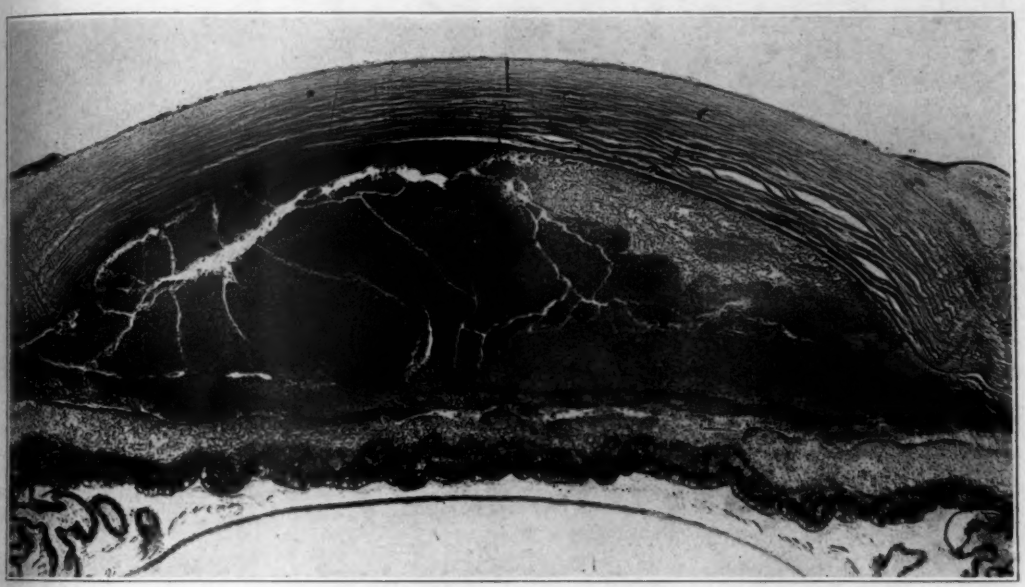

Fig. 3 (case 2).—Hypopyon keratitis. Note the edema of pigment epithelium of the iris. Low power magnification.

was under the keen observation of its mother and nurses, who had never noticed any abnormality of the eyes until February 15. At that time, when Dr. Dennett asked me to see the infant, both eyes appeared normal, externally, except the lenses. The pupils were normal and reacted promptly to light. The pupils were dilated with a 1 per cent atropine solution, exposing both opaque lenses. They were suddenly, simultaneously, and similarly involved, having a homogeneous and bluish appearance resembling skimmed milk, and the lenses were also slightly swollen. I saw the infant a month later, when there was apparently a slight increase in the opacification. Ophthalmoscopically, at no time was it possible to

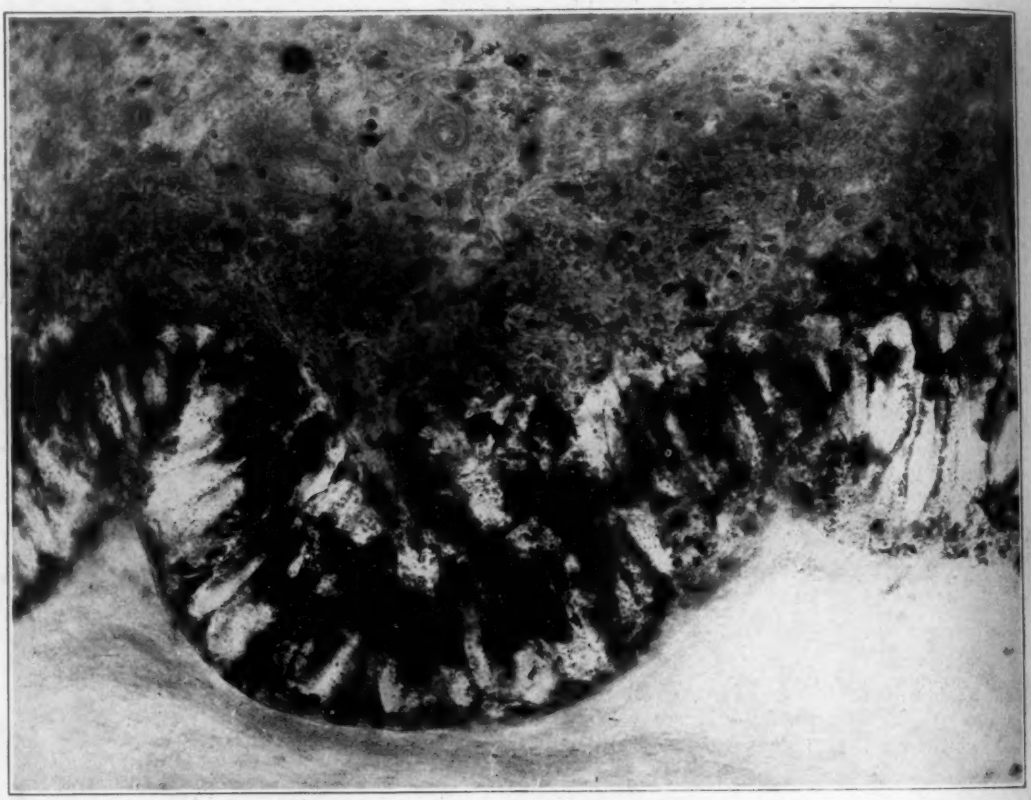

Fig. 4 (case 2).—Edematous pigment epithelium shown in figure 3. The dense zone of cells above the epithelium is the distorted dilator muscle. High power magnification.

make out any fundus reflex. On March 19, the child again developed diarrhea, the urinary sugar remained the same, and the blood sugar was 175. He died on April 3, 1929. The cataract evidently developed when the child was 1 year and 1 month of age.

This case represents the youngest age on record at which diabetic cataract occurred. In a paper by Dr. Harry Gradle in 1926, entitled "Lens Opacities in Diabetic Cataracts," published in the "Contributions to Ophthalmic Science" dedicated to Dr. Edward Jackson, Dr. Gradle

quoted Galezowski's case of diabetic cataract in a child at the age of 9 years as being the case of the youngest patient with this condition on record.

In this connection, the work which is being performed on the lenses of oxen at the Post-Graduate Hospital may be of interest. Fresh lenses immersed in Ringer's solution and incubated develop the power to convert dextrose into lactic acid. It has not been possible to recover the

Fig. 5 (case 2).—Blood vessels of the iris shown in figure 3. The three largest blood vessels show the thickening of the intima. High power magnification.

lactic acid in amounts to be expected from the breaking down of dextrose, probably because the lactic acid undergoes a further decomposition into carbon dioxide. The same utilization of dextrose occurs when lenses are immersed in the aqueous humor of oxen, but no change takes place if they are immersed in the vitreous humor. All solutions were kept sterile during these experiments. Further experiments with this evident metabolism of the lens are being undertaken. This ability to utilize dextrose is apparently dependent on the presence

of glutathione in the lens. The production of cataracts in diabetic persons may be an expression of general inability to utilize dextrose, and in common with all the tissues of the body the lens therefore degenerates.

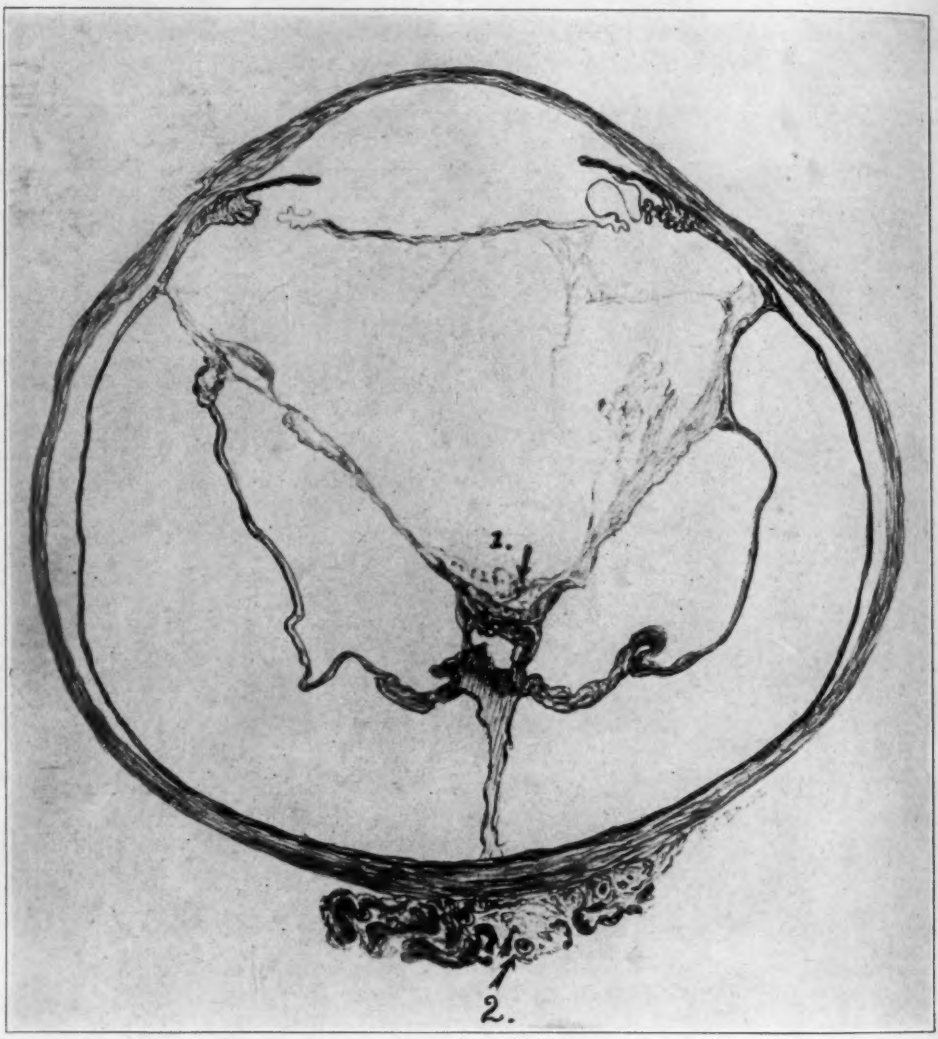


Fig. 6.—Diabetic retinitis. *1* indicates retinitis proliferans; *2*, endarteritis obliterans of the long posterior ciliary artery, typical diabetic lesion (previously reported by Dr. Meeker).

The amount of sugar in the normal lens ranges from 20 to 30 per cent of the blood sugar. In the case of a Chinese who was admitted to the Post-Graduate Hospital, and who died after a few days in diabetic coma, the lens contained 0.76 mg. per hundred cubic centimeters

of sugar; his blood sugar was 1.36 mg. Regardless of the high amount of sugar in the lens, his lenses were not cataractous.

It is surprising to find so few cases of iritis occurring, regardless of the microscopic changes found in the iritic blood vessels, dilator muscle and the degeneration of its posterior pigment epithelial layer. The deteriorated structure of the iris tissue may be due to the marked sclerosis of the iritic vessels; and the degeneration of the epithelium

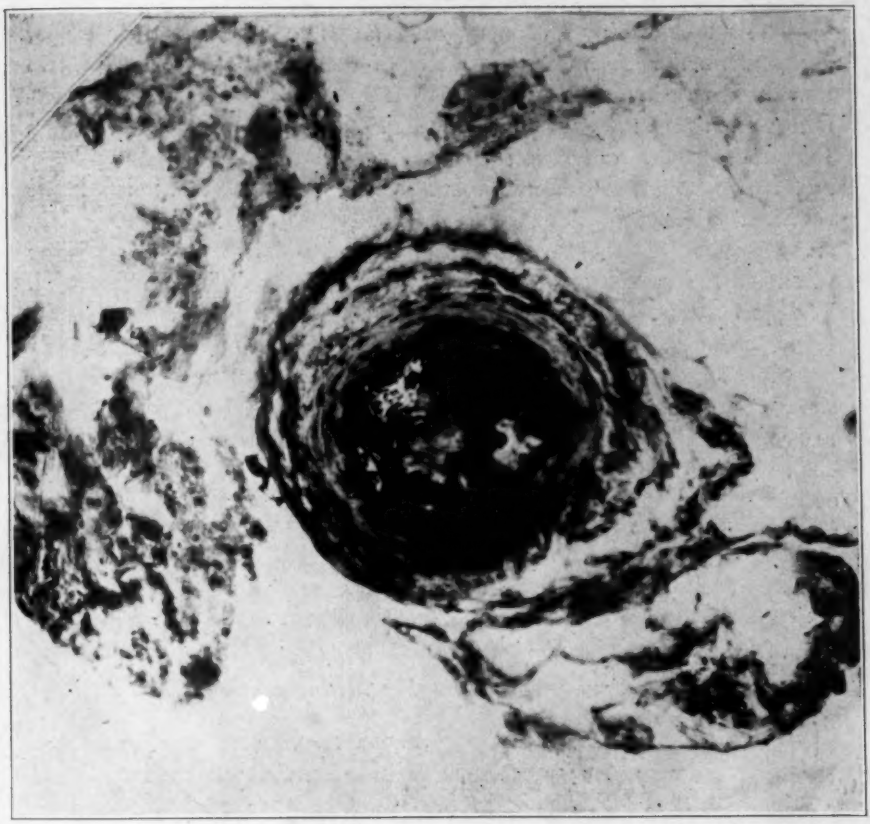

Fig. 7.—High power photomicrograph of *2* in figure 6. Weigert's elastic tissue stain (Dr. Meeker's case).

to the same cause, or to its direct contact with the chemically altered fluid mediums.

The general and dietetic treatment, with or without insulin, has proved of value in some of the ocular complications in diabetes, except in its retinal complications. Probably when arteriosclerosis affects the retinal vessels, no beneficial effect is to be expected from the use of any therapeutic agent.

1 West Eighty-Fifth Street.

# ALLERGIC PHENOMENA IN TUBERCULOUS KERATITIS

## REPORT OF TWO CASES *

CHARLES W. TOOKER, M.D.
ST. LOUIS

The words allergy and anaphylaxis seem to have lost their earlier sharp distinction of meaning. Many of the recent reports on protein reactions are somewhat confusing to the reader because of the uncertainty regarding the nature of the phenomena described. Indeed, Van Leeuwen,[1] Doerr and others have expressed the opinion that allergy and anaphylaxis are quite similar and may be only variations of one reaction. Richet, in 1902, was the first to use the term anaphylaxis, and described it as a shocklike reaction induced in an animal by the second injection of a protein to which it had been previously sensitized. The symptoms of the many reports subsequently published were chills, fever, collapse, prostration and sometimes death. In 1916, Cooke[2] introduced the term allergy to designate a number of conditions which show one common etiologic characteristic, namely, hypersensitiveness to proteins or other substances which are innocuous to normal people. This condition differs from anaphylaxis in that it is often inherited, occurs without previous sensitization, has not been produced experimentally in animals, and has comparatively mild symptoms resembling those of drug idiosyncrasy. Drug idiosyncrasy itself may be regarded as an allergic reaction, for frequently a small quantity of a drug will produce a series of symptoms having no relation to the normal action of the drug. The sharp differences between allergy and anaphylaxis are emphasized by Coca[3] who believed the two conditions to be separate and distinct reactions.

There are not many studies of ocular anaphylaxis and allergy in the literature. Wessely[4] was able to produce an anaphylactic parenchymatous keratitis in rabbits. Schieck[5] recently stated that the only real evidence of ocular anaphylaxis is to be found in animal experi-

* Submitted for publication, June 28, 1929.

* Read at the meeting of the American Ophthalmological Society, Hot Springs, Va., June 10, 1929.

1. Van Leeuwen, W. S.: Allergic Diseases, Philadelphia, J. B. Lippincott Company, 1925.

2. Cooke, R. A., and Van der Tee: J. Immunol. **1**:201, 1916.

3. Coca, in Tice, Frederick: Practice of Medicine, Hagerstown, Md., W. F. Prior Company, Inc., 1917.

4. Wessely, K.: München. med. Wchnschr. **58**:1713 (Aug. 8) 1911.

5. Schieck: Ztschr. f. Augenh. **32**:95, 1914.

mentation. He favored the hypothesis that tuberculous keratitis is an anaphylactic reaction due to the toxins of the tubercle bacillus. Luedde [6] wrote that the tuberculin reactions regarded as specific may be allergic phenomena. The effect on ocular lesions of eating protein and nonprotein foods to which a patient is sensitive apparently has not received much attention. In the two cases of tuberculous keratitis herein reported, the patients exhibited definite ocular allergic reactions following the ingestion of certain protein and nonprotein food during the course of the disease. The reactions recurred frequently enough to establish the opinion that they were not fortuitous.

Tuberculous keratitis was described by Rollet and Colrat [7] as primary and secondary. Although Roy and Alvarez [8] reported an apparently indisputable case of primary corneal tuberculosis in 1885, it is doubtful whether the disease is ever primary, except in the sense that a corneal trauma may incite a tuberculous keratitis in a person who harbors occult tuberculosis. The secondary type is either superficial and ulcerative, having its origin in a tuberculous conjunctiva, or interstitial, arising from tuberculous disease of the ciliary body and iris or of the sclera or by infection through the aqueous humor. This last mode of infection may be the true path of entry of the tubercle bacillus or its toxin which produces tuberculosis of the anterior segment of the eye, according to Verhoeff's [9] experiments. The tubercle bacillus and its toxins are the sole etiologic factors in only a small proportion of the cases of interstitial keratitis, but the type of interstitial keratitis produced by them is characteristic. Rollet and Colrat differentiate tuberculous keratitis from other types by the following clinical features: The infiltration occurs in the middle and deeper layers of the cornea, often in only a sector of the cornea, and usually in the inferior portion; vascularization is similarly situated; in some cases nodules develop in the lower portion of the cornea; the disease is unilateral, and the cornea does not become cleared rapidly or completely. The two case histories which follow seem to be histories of tuberculous keratitis even though anatomic proof could not be obtained because enucleation was not necessary.

## REPORT OF CASES

CASE 1.—L. C. H., a man, aged 28, consulted me in July, 1926, because of an inflamed left eye which had not recovered from a keratitis beginning six months previously, although the patient had been under the care of an ophthalmologist

6. Luedde, W. H.: Am. J. Ophth. **6**:161, 1923.

7. Rollet, E., and Colrat, A.: Tuberculose de l'oeil et de ses annexes, Paris, Gaston Doin, 1927.

8. Roy and Alvarez: Rev. clin. d'ocul., 1885, quoted by Rollet and Colrat (footnote 7).

9. Verhoeff, F. H.: Arch. Ophth. **42**:471, 1913.

during that time. At the age of 14, he had suffered from an apparently similar attack in that eye, and had recovered under treatment lasting a year. Of interest in his family history are the notes that his mother suffered from migraine and that one brother had "hives" after eating certain foods. The patient was readily poisoned by ivy, and atropine used in his eye caused a severe local dermatitis. The latter reaction is an angioneurotic edema analogous to allergic reactions, according to some recent writers. The teeth of the patient have been cared for properly, the tonsils removed, and the accessory nasal sinuses treated when necessary by a competent rhinologist. The Wassermann reaction of the blood was negative. The prostatic gland was somewhat "soft and boggy," but required no treatment. The reactions to tuberculin were positive generally, locally and focally. There was no history of injury to either eye. The right eye was normal in all respects. The left eye had vision equal to the recognition of hand movements. Its pupil was small because of old iridic adhesions to the capsule of the lens. The lower half of the cornea was clouded by a grayish-white infiltration, and there was moderate pericorneal injection. No nodules were present in the visible iris or in the cornea. A satisfactory view of the fundus could not be obtained.

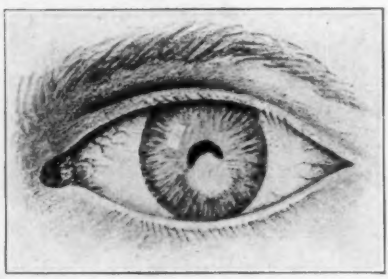

Fig. 1 (case 1).—Tuberculous eye in January, 1929.

In addition to using various local remedies, he was placed under the care of an internist who gave him a thorough course of injections of tuberculin, which apparently did not benefit the ocular disease. The internist tested the patient for reactions to food by the intradermal method, by the cut method and by experimental feeding. Definite exacerbations of ocular inflammation invariably followed the eating of cherries, rhubarb, plums, cocoanut, frankfurters, wheat, and sometimes pepper, lemon juice and vinegar. This reaction was characterized by ciliary injection, a slight congestion of the iris and a slight additional blurring of vision. The reaction began several hours after eating the particular foods and continued for from one to three days. After removal of these foods from the patient's diet and the observation of general health measures, the condition in the eye has remained quiet for many months. During the last two years, his general health has been excellent. The condition of the tuberculous eye in January, 1929, is illustrated in figure 1.

Case 2.—Miss M. W., aged 21, consulted me in March, 1926, because the left eye had been inflamed for about three weeks. The family history was unimportant, and the previous health of the patient had been excellent. Examination of the left eye revealed a white infiltration just below the center of the cornea, irregularly circular and about 2 mm. in diameter. There was little ciliary injection, and the pupil was well dilated. The patient had been using medicine prescribed by a physician. The eyeground was normal and the vision 20/30. The right eye was

normal. There was no history of injury to either eye. The patient was sent to the hospital for examination and study. The teeth, throat and accessory nasal sinuses were normal. During a period of three months, several Wassermann tests of the blood gave negative reactions. The reactions to diagnostic injections of tuberculin were positive generally, locally and focally.

During the next twelve months the patient was given a thorough course of injections of tuberculin by the internist to whom she was referred. The amounts of tuberculin B. E. (bacillus emulsion) were not sufficient to cause a focal reaction except for a few times, once at the beginning of the treatment when 0.0001 mg. was injected and again when the dosage was increased considerably. During this period, the corneal infiltration extended and became also more superficial. The iris did not show marked changes, but ciliary injection was noted frequently. Soon after the use of atropine, the patient developed an angioneurotic edema of the left lids, and the use of atropine was discontinued. Scopolamine kept the pupil well dilated. The internist subjected the patient to various food sensitization tests and

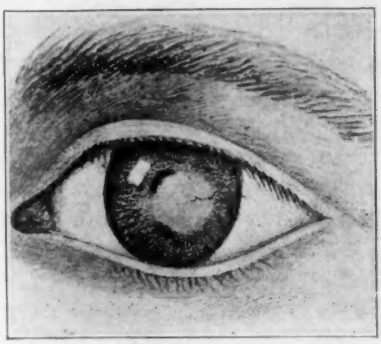

Fig. 2 (case 2).—Tuberculous eye in March, 1929.

gave her many injections of tuberculin and a course of sun baths. Some of the longer exposures to sunlight in the open air caused a mild ocular reaction. These are the internist's notes regarding her food reactions: "Exacerbations of eye symptoms occurred following the eating of apple, egg, potato, milk, oatmeal and pork. Minute doses of potassium iodide produced nausea." These exacerbations were characterized by marked ciliary injection and pain. The attacks began within six hours after she had eaten these foods and usually lasted two or three days. In May, 1928, the right cervical glands became enlarged; and in July, 1928, the left cervical glands were palpable. In January, 1929, these glandular enlargements had not subsided completely, but the patient seemed to be enjoying good health, had gained in weight and was regularly employed at her work as a stenographer. Attacks of pain and redness in her left eye almost invariably followed dietary indiscretions with proscribed foods. By careful attention to the character of her food, she has been free from ocular discomfort for six months. The vision in the left eye at present equals the recognition of hand movements, but there are no synechiae. On examination, March 20, 1929, the cervical glands were not enlarged or indurated. Figure 2 indicates the present appearance of the eye. The increased density of the opacity in the upper part of the leukoma probably represents a tuberculous nodule.

COMMENT

The diagnosis in these two cases of tuberculous interstitial keratitis seems to be as well established as is possible without anatomic demonstration. An opinion regarding the efficacy of tuberculin or conjectures about the essential nature of the tuberculin reaction, whether truly specific or only the effect of its protein content, seem hardly warranted from such a limited study. In the two foregoing cases, however, tuberculin neither retarded the development of the disease nor prevented the resulting corneal opacities. The general physical condition of the patients seemed to be as satisfactory during the time they did not receive injections of tuberculin as when they did receive it. In one of the cases, cervical adenitis developed after a thorough course of tuberculin. Of more interest perhaps were the ocular reactions in both cases to certain ingested foods. These reactions were not those of anaphylactic shock, according to the present understanding of that term. They belong rather to that group of phenomena called allergy. In one case there was a family history of conditions regarded as probably allergic. In both cases ocular reactions uniformly followed the ingestion of certain protein foods, and both patients had definite drug idiosyncrasies. The literature on ophthalmology contains few similar reports, and little experimental work has been recorded about food reactions affecting the eye. It is therefore difficult to formulate conclusions of value. It is probable that allergic ocular reactions to ingested foods are not phenomena peculiar to tuberculous keratitis. These patients may have been hypersensitive before the onset of the tuberculous infection. When, however, an atropine angioneurotic edema occurs in the course of tuberculous keratitis, a thorough investigation of other possible allergic reactions should be made so that some of the exacerbations of the disease may be avoided or their severity mitigated. Those who employ specific therapy advocate the use of tuberculin in dosages small enough to avoid focal reactions. The allergic reactions in these two cases were often more severe than those seen after injections of tuberculin which produce a focal reaction. In the treatment of patients with tuberculous keratitis, therefore, focal allergic reactions to ingested foods may be of considerable importance.

# RETINOBLASTOMA IN HOMOLOGOUS EYES OF IDENTICAL TWINS*

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ROCHESTER, MINN.

The occurrence of neuroblastoma in homologous eyes of twins has not been reported so far as I can learn by search of the literature. In 1922, twin girls were brought to the Mayo Clinic, one of whom had a tumor in the left eye and the other a tumor in each eye. There are several reasons for considering these girls identical or enzygotic twins. The occurrence of the tumors in similar situations in the left eyes lends support to the theory that these tumors develop from fetal rests that probably go back to the single ovum from which such twins develop.

## REPORT OF CASE

The twins, Charlotte and Charlene, were born at full term, without any difficulty in delivery. In their development, they were so strikingly similar in appearance that they could not be identified by natural differences. Two boys had been born to the parents previously and were living and well. The mother had a twin sister, but the resemblance between them was less than that which existed in the case of her daughters. The mother had twin nieces and two pairs of twin cousins. In all cases, the twins were of the same sex and about equally developed. A history of tumor or other developmental anomaly running through the family was not elicited.

Charlotte and Charlene were of equal size at birth (6 pounds [2.7 Kg.]) and made equal growth. They had dark, straight hair, brown eyes, dark olive skin and perfect teeth. At the age of 4 years, the members of the family could distinguish one from the other, but to strangers the differences between them were almost imperceptible.

Late in February, 1922, the parents first noticed that in Charlotte's left eye there was a yellowish-white reflex from the pupil and that the vision of that eye was less than that of the right. At times, the child would complain of pain in the left eye that would last for a few days and then disappear. Not realizing the significance of this reflex and pain, the parents did nothing about it, but they kept watch of the eyes of the sister. In August of the same year, they noticed a similar white reflex from Charlene's left eye which they thought came from a growth in the lower part of the globe. The twins were referred to the Mayo Clinic in December, 1922. The general examination at this time did not reveal an abnormal condition aside from that of the eyes. A serum Wassermann reaction was negative.

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* From the Section on Ophthalmology, the Mayo Clinic.

* Read before the American Ophthalmological Society, Hot Springs, Va., June 10 to 12, 1929.

*Charlotte.*—The right eyelids, the conjunctiva, the pupil and the reflexes were normal. The cornea and humors were clear; the fundus was normal. In the left eye there was mild photophobia. The conjunctiva was slightly injected; the cornea was clear and the chamber shallow. The pupil was dilated widely; only the margins of the iris could be seen at the limbus, and the pupillary area was filled with an opaque and pigmented lens. Transillumination was poor, indicating a tumor practically filling the vitreous chamber.

On Dec. 7, 1922, the left globe was removed, together with as much of the optic nerve as could be obtained. The globe was enlarged, the sclera was thin, and the optic nerve for 15 mm. back of the globe was enlarged (8 mm.) and appeared to be filled with tumor cells. Beyond this, the nerve was of normal size. There was a distinct line of demarcation in the nerve, showing how far the tumor had extended.

Fig. 1.—Section of nerve through the disk of the left eye of a twin (Charlotte) showing extension of the tumor and destruction of the nerve. The pathologists reported neuroblastoma or cellular glioma. The child died of intracranial extension five months and nineteen days after operation.

Pathologic examination of the distal end of the nerve did not reveal tumor cells, whereas a section near the globe was filled with tumor. The globe contained a large tumor of the retina and optic nerve, a neuroblastoma or cellular glioma (fig. 1).

Convalescence was uneventful, and on Feb. 9, 1923, the patient was dismissed with an artificial eye in the left socket. She returned on March 19, with a history of pain over the left eye, daily vomiting and a daily rise in temperature for the preceding three weeks. She was emaciated, dull and stuporous. The right eye and orbit were normal. A little fulness of the left orbit could be palpated. Further exploration revealed the posterior half of the orbit filled with a mass which on microscopic examination was found to be cellular glioma. Radium (2,000 milli-

gram hours) was applied to the orbit, following which the mass receded and the edema of the lids became less. The patient returned again on May 4, with a large tumor protruding from between the left lids and symptoms of intracranial extension. She died on May 26, 1923.

Necropsy revealed recurrence of glioma in the left orbit and extension throughout the brain. There was hemorrhagic softening of the frontal lobes with internal hydrocephalus and terminal hemorrhagic meningitis.

*Charlene.*—The tumor was first noticed in the left eye in August, 1922, about four months before the patient was brought to the Mayo Clinic. The tumor had grown until a large grayish area could be seen with retinal vessels over it. Sharp pain of short duration occurred at intervals in the left eye. Both pupils were dilated with homatropine for examination.

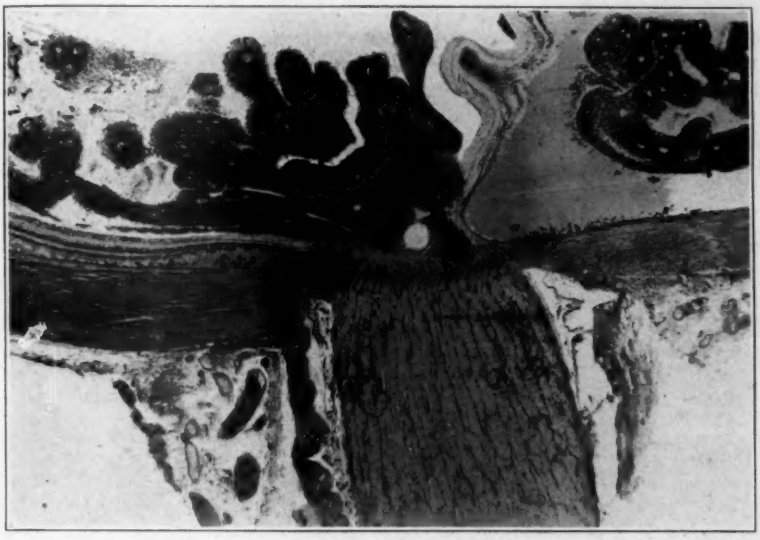


Fig. 2.—Section of nerve through the disk of the left eye of a twin (Charlene) showing tumor of the retina without invasion of the optic nerve. The child is living and well more than six years after operation.

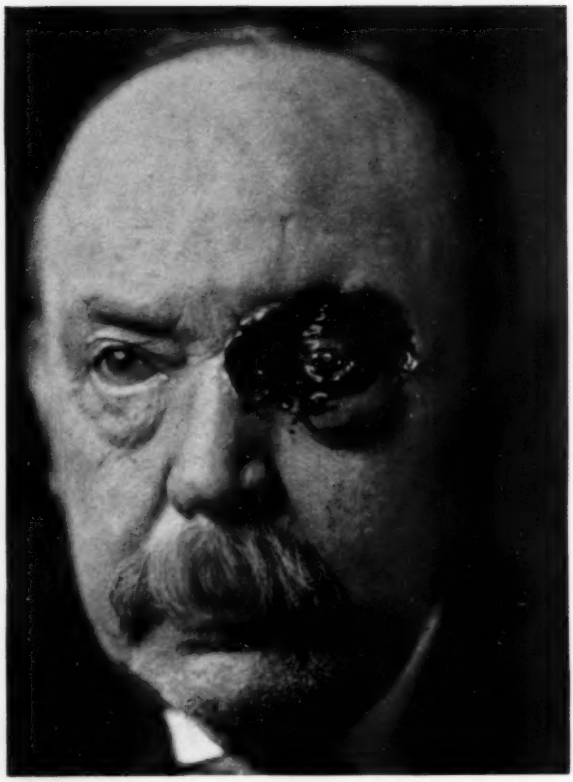
In the right eye, the cornea, the lens and the humor were clear; the disk appeared normal. In the inferior temporal quadrant was a yellowish subretinal mass, elevated 5 diopters at the margin nearest the disk and increasing toward the periphery. The margin of the mass was distinct, about 3 disk diameters from the disk margin, with many small, grayish-white, round areas surrounded by a narrow line of pigment. In the central area of the mass was a large vessel, which came from the inferior temporal retinal artery. The retinal detachment was of irregular shape and light red, and extended from 5 to 9 o'clock, the central portion being more elevated and grayish white.

The cornea and the lens of the left eye were clear. There were small and large floating opacities in the vitreous, and in the lower nasal quadrant was a grayish-white elevated irregular mass, with retinal vessels coming forward in arborization in the upper part of the mass. There were a few grayish-white strands extending toward the disk from the highest portion of the detachment. There were marked

choroidal and retinal disturbances around the mass on the peripheral side. Transillumination was poor in the lower half of the globe.

It was decided to enucleate the left eye and to use radium on the right eye until it could be determined whether the growth was extending toward the disk. The operation was performed on the same day as that of the twin sister (Dec. 7, 1922). The optic nerve was removed with the globe, and it appeared to be normal.

Microscopic examination of the globe showed neuroblastoma or cellular glioma (fig. 2). The socket healed readily, and there has been neither recurrence nor extension. Radium was applied over the right eye several times each year until 1928, when it became evident that the growth was destroyed and that only a large area of choroidal destruction marked the place where it had been. There was considerable fluctuation in the size of the mass between applications of radium. In 1924, the vision without correction was 6/12 +. The child entered the public school and kept near the head of her class until vision began to fail in the autumn of 1927, owing to the development of posterior cortical cataract. On May 9, 1928, the anterior part of the lens was clear but on the posterior capsule was a dense layer of granular substance, more dense at the center. The large vessels of the fundus could be seen, but the details of the disk were obscured. In the inferior temporal quadrant was an irregular area, 2 by 3 disk diameters, which gave a white reflex. The area was not elevated and, although not clearly focused, was apparently on the same level as the fundus. Large vessels were not seen in that region, and there were no other lesions present. Transillumination was now good. The tumor had been destroyed by the radium. The increasing cloudiness of the lens is characteristic of complicated cataract seen in eyes with extensive choroidal destruction and probably is not due to the direct action of radium.



Appearance of patient with neglected epithelioma of the eyelids.

# COMPLETE EXENTERATION OF THE ORBIT BY MEANS OF ELECTROCAUTERY FOR NEGLECTED EPITHELIOMA OF THE EYELIDS

## REPORT OF A CASE*

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PITTSBURGH

Exenteration of the orbit is an operation so seldom necessary that its scarcity warrants the report and the placing on record of the following case:

F. W., a man, aged 66, first came under observation in January, 1924, with the history that about nine years previously a "lump" had appeared at the inner canthus of the left upper eyelid. He was under observation and received treatment at intervals during this time, suffering much at the hands of many.

Examination showed that the right eye was normal, with a visual acuity of 20/40 and ability to read Jaeger test-type no. 1, with presbyopia corrected.

The left eyeball stood isolated in the orbit with an area of complete destruction extending over the upper lid and the underlying tissue, up on to the nose, including the eyebrow, and to the limits of the bony orbit on the temporal side; the skin of part of the lower lid was preserved, but the everted lower lid showed an edematous palpebral conjunctiva. In fact, words form a meager description of the actual appearance, which is well portrayed in the accompanying illustration.

The diagnosis was a rodent ulcer or skin cancer or epithelioma.

The only rational treatment, of course, was the removal of the eyeball and the orbital contents.

At a meeting of this society held in Washington in 1916, I reported a case of melanosarcoma of the orbit,[1] at which time I made the observation that "the experience of this case has also suggested the use of the electrocautery knife, at a cherry-red heat, so as not to carbonize the tissue, for the removal of the malignant mass from the orbit instead of the knife, as has been suggested for the removal of malignant tissue from other parts of the body." Hence, this method was employed to remove the orbital contents in this case: first, the peripheral portion of the skin back into the healthy skin was cauterized and then, by making a series of multiple punctures directed toward the apex of the orbit and keeping close to the orbital wall by beginning at the nasal side and carrying it around to the temporal side and sacrificing the entire lower lid, after the removal of the orbital mass, the entire orbital walls were seared over with the red-hot electro-

* Submitted for publication, June 10, 1929.

* From the Service of the Allegheny General Hospital.

* Read at a meeting of the American Ophthalmological Society, Hot Springs, Va., June 10, 1929.

1. Heckel, E. B.: Melanosarcoma, Arch. Ophth. **45**:465, 1916.

cautery. There was practically no bleeding. The wound was dressed by dusting it with boric acid powder and placing over it dry sterile gauze, i. e., without packing the orbit.

The operation was done with the patient under ether anesthesia; of course, all precautions were taken against ignition of ether vapor. The operation was done on February 1, and the patient left the hospital on February 10, nine days after the operation. He received some postoperative roentgen treatment, followed by uneventful healing; the skin retracted into the orbit, and the orbit filled up somewhat with healthy granulation tissue.

# HEMORRHAGES IN THE FUNDI IN HYPERTENSION *

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Within the past few years it has been possible to differentiate arteriosclerosis and hypertension more accurately than ever before. Previously both conditions were classified as arteriosclerosis. Since arteriosclerosis could be distinguished from hypertension, it became necessary to determine to which condition hemorrhages in the eye belonged.

These studies were made in the hospital for diseases of the eye in Munich by Mrs. Lange, with the help of Professor Wessely, the chief of the hospital. I made the medical examinations in the Medizinische Klinik of Professor von Romberg.

In the department for diseases of the eye and in the first medical clinic of the University of Munich, we have thoroughly examined all cases of retinal hemorrhages occurring in the hospitals and in the outpatient departments during the last year and a half. There are altogether sixty cases. We have, of course, excepted all hemorrhages due to trauma, tumors, myopia maxima, diseases of the blood, neuroretinitis or congested papilla in cases of tumor of the brain.

Hemorrhages may occur anywhere in the retina. Concerning the localization, it is interesting to observe that in three quarters of the cases from the department for diseases of the eye the hemorrhages were in the region of the fovea. In contrast to this, in the cases from the medical clinic the hemorrhages occurred only in the periphery, without any involvement of the fovea. The result shows that only those patients whose vision was poor because of the hemorrhages came to the department for diseases of the eye. Thus, one can see how easily a false conclusion can be formed about the area of predilection of the hemorrhages when the material from only one clinic is considered.

In our material, the hemorrhages in the fundus of the eye differ in size and shape. They may be small and stippled areas, larger and delta-shaped, spraylike or large and flame-shaped. Some of the small, stippled hemorrhages are unrelated to the presence of visible blood vessels, and some are near arteries and veins. The larger hemorrhages occur in the region of the papilla or from arteries of medium or large size. Sometimes, however, there is no local relation to visible blood vessels. The

* Submitted for publication, May 10, 1929.

* Read before the Section on Ophthalmology, New York Academy of Medicine, April 15, 1929.

large, flame-shaped hemorrhages are usually found in the region of veins. It is remarkable to observe that in cases with large, flame-shaped hemorrhages, small, stippled hemorrhages are also usually present. It is evident that in addition to recent hemorrhages, older or partly reabsorbed ones or the final stage of hemorrhages represented by pigmented or depigmented spots may be found. Hemorrhages may occur in one eye or in both eyes.

The medical examination of the patients was made by the methods that we used for differentiating arteriosclerosis from hypertension.

We speak of cases of pure hypertension if the systolic and diastolic blood pressure is constantly high, if we cannot find any arteriosclerotic changes in the peripheral arteries and if the kidneys are not involved. The diastolic blood pressure is usually above 100 mm. of mercury. We speak of pure arteriosclerosis if we find arteriosclerosis anatomically in the large and small arteries and if the blood pressure is normal or lower than normal. The diastolic blood pressure is usually low (between 50 and 80 mm. of mercury).

By clinical methods and by examinations of the reactability of the blood vessels we were able to show in the pure cases that the two conditions can be differentiated, and that hypertension and arteriosclerosis are in reality opposite conditions. I will give briefly the results of the tests which were published in the *Deutsches Archiv für klinische Medizin* during the last two years.

1. One can see the blood flow in the capillaries of the skin of the finger. When the flow in the arm is stopped by inflation of a blood pressure cuff on the upper arm, it does not stop at once. The time elapsing before the blood flow is stopped is normally changed when warmth or cold is applied. Normally, the average time drops from seven to two seconds after the application of warmth, and increases with the application of cold. In arteriosclerosis no reaction of the blood vessels occurs, the time remaining the same. In hypertension the reaction seems to be the opposite, and there is an increase during warmth and a decrease during cold.

2. If one winds a rubber band around the finger from the tip toward the hand and removes the band quickly, in arteriosclerosis the finger becomes red again immediately, but in hypertension from thirty to sixty seconds pass before the finger gets red. Measuring these reactions thermo-electrically, one sees in arteriosclerosis an immediate rise in the curve, while in hypertension it occurs only fifty seconds after removal of the band. This test also shows hyperreactivity of the blood vessels in hypertension and a diminished reactivity in arteriosclerosis.

3. If one observes the blood pressure in one arm and places a cuff around the four limbs at the same time and then inflates them, one sees a great rise in blood pressure in hypertension, while there is almost no change in arteriosclerosis.

4. If one determines the temperature of the skin of the abdomen after warming it by a hollow receptacle to 50 degrees for one minute or after chilling it by an icebag, one sees the opposite reaction in arteriosclerosis and in hypertension.

5. If one measures the temperature of the stomach before and after a stimulation is given, the temperature rises in hypertension and does not change in arteriosclerosis, depending on the reaction of the blood vessels.

6. In arteriosclerosis the kidneys react less, the specific gravity and output of urine being fixed. The reverse is true in hypertension. The salt concentration after a meal is increased, and the change in the output during the day is higher than normal.

7. In cases of pure hypertension, the heart is enlarged, it is situated vertically, the weight is increased, and there is muscular hypertrophy. In arteriosclerosis the heart is dilated, the weight is not increased, the heart is large and is situated horizontally. There is no hypertrophy of the heart muscle, but dilatation.

Of our sixty cases of retinal hemorrhage, fifty-seven showed a systolic blood pressure of over 160 mm. of mercury; in most of these cases the pressure was over 200.

In fifteen of these fifty-seven patients with hypertension, we could not find any signs of arteriosclerosis with our clinical methods. These fifteen patients showed an increased reactability of their blood vessels. That means that there was pure hypertension without arteriosclerosis.

The arteries of the fundus of the eye were usually changed in a characteristic way; there were differences in the caliber of the arteries, so that in the same artery we found narrow parts irregularly succeeded by broader ones. Sometimes the lumen was smaller. In two cases these changes in the arteries disappeared after some weeks, so that the contraction must have been temporary; in all the other cases, however, we found these changes permanent. The walls of the arteries often seemed to be thickened when such differences in caliber were present. The veins also showed differences in caliber similar to those of the arteries. These changes in the blood vessels depend on the degree of hypertension; in cases with higher blood pressure, they were more frequent and more distinct. In hypertonic patients, they were generally found when the blood pressure was more than 200 mm. of mercury, and were generally absent when it was less than 180 mm.

The other forty patients presented clinical signs of arteriosclerosis in addition to hypertension; they were the type of patients we usually see who have hypertension and arteriosclerosis. The average age of these patients was higher than that of patients with pure hypertension only.

In more advanced cases of arteriosclerosis and hypertension the blood vessels of the fundus were changed in the same way and as frequently as in cases of pure hypertension. Besides the differences of the caliber, we found imbibitions of calcium and cholesterol corresponding with the degree of clinical arteriosclerosis.

In an accurate study of all our cases of retinal hemorrhages, we could not find a case of arteriosclerosis without hypertension. As a

control of our results, we made ophthalmoscopic examinations of patients with clinically pure arteriosclerosis with low blood pressure. We never observed retinal hemorrhages in these cases.

Only 10 per cent of our patients with distinct arteriosclerotic changes in the large arteries of the trunk or extremities had calcium and cholesterol imbibitions in the arteries of the retina. In a few we found variations in the caliber of the arteries, but to a far smaller degree than in hypertonic patients. Only three of sixty patients with retinal hemorrhages did not show high blood pressure. The etiology of the hemorrhages in these three exceptions could not be discovered. However, we were sure that there were no signs of arteriosclerosis. In cases of hemorrhages of other origin also, diabetic or syphilitic, we found high blood pressure, with few exceptions. The fact that this occurs was mentioned by Wessely years ago. Hemorrhages of the retina should be an indication for determination of the blood pressure.

## SUMMARY

In patients with retinal hemorrhages, we have found a high blood pressure. We have never found pure arteriosclerosis. Cases of pure hypertension point to the causal relation of the hypertension to the origin of the retinal hemorrhages. Accordingly, the retinal hemorrhages are not a part of the arteriosclerosis, but a part of the hypertension.

In cases of hypertension, we often observed abnormalities of the blood vessels of the eye, differences in caliber or tortuosities. Sometimes our attention was called to the existence of hypertension only by these abnormalities. However, we found them, though much less extensively, in arteriosclerotic and in normal persons, so that we are not able to say with certainty to which disease they belong.

Subconjunctival hemorrhages not due to trauma seem to have the same origin. We found that they were caused by pure hypertension in a small number of cases.

According to our observations, retinal hemorrhages show an interesting conformity with cerebral apoplexy. We never found cerebral apoplexy without hypertension unless hypertension was masked by cardiac insufficiency. We found the same factors responsible for retinal hemorrhages.

The majority of cerebral hemorrhages originate in the capillaries, as was shown by Westphal and Baer. Rarely, the hemorrhages occur because of the bursting of larger blood vessels.

The retinal hemorrhages which are sometimes small and without any relation to visible blood vessels seem also in a large number of cases to be of capillary origin.

# EYE SYMPTOMS AND THE PARKINSONIAN SYNDROME *

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Definite etiology in association with clearly defined symptomatology and confirmation by microscopic study must be made and interpreted before the relation of the parkinsonian syndrome to ocular symptoms can be classified clearly. In some cases a clear association is defined, and again it seems extremely difficult to fathom the combination. Encephalitis is so varied in its portrayal of symptoms; in certain phases it has a predilection for ocular muscles and again it apparently ignores the ocular syndrome. Whether it is due to a toxin that varies in the stages of intensity, the degree of intensity or concentration, I am not able to state definitely. Much has been written about encephalitis, but after a perusal of the literature one finds that there is a good deal of conjecture with nothing definite to substantiate it. To visualize encephalitis brought about by a blood-borne infection, and years afterward to find ocular palsies, compels one to be rather reserved in making conclusions as to the direct factors associated with these manifestations.

Exhaustive study of many cases and the pathology applied to the many phases of the condition lead to interesting deductions. This ocular symptomatology of the postencephalitic cases is far from clear.

The difficult and at times transient muscle imbalances—the changes from a normal to an excessive variation—certainly result in untenable diagnoses. Of course, one can say that encephalitis is the cause of muscle behavior, but to obtain relief from this spastic condition is difficult and unsatisfactory. It is comforting to know the cause, but the aim is to cure. Various toxemias also bring about these muscle spasms, and they must be definitely ruled out before one can state that the muscular condition is an evidence of a postencephalitic state. This problem is difficult to work out satisfactorily—especially to make the patients comfortable and for close work. Of course, when a definite paresis is present the etiology is more certain; but, when there is a partial or spastic condition of the ocular muscles, either internal or external, the problem becomes more complicated and the results more unsatisfactory. The retarded action of the superior recti, and the impossibility of holding the muscles for any length of time without tiring, especially when the patient is observing intently, is rather characteristic; anisocoria may be associated with these symptoms.

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* Read before the Baltimore Medical Society, Section on Ophthalmology.

Nonne, considering ocular changes in relation to encephalitis, in contrast to other ocular symptomatology, made the following classification:

1. Encephalitis in which bulbar symptoms are present.
2. Premature paralysis agitans, but without an inclination to sleep.
3. Bulbar paralysis without ocular changes.

Von Economo, Stein, Oberndorfer and Nonne have shown from pathologic research that the symptoms are due to a nonpurulent polioencephalitis. Sometimes it is associated with hemorrhages; probably it is a degenerative process taking place in the great basal ganglions, especially the optic and corpora quadrigemina, in the aqueduct of Sylvius and in the floor of the fourth ventricle. Some cases have shown small cell infiltration of the leptomeninges and pial septums of the spinal cord.

According to recent anatomicophysiologic researches, at least four more syndromes to the region between the commissural mesencephalic nuclei and the globus pallidus are recognized, all connected with forced movements of the eyeball. They may be classified as follows:

1. Mesencephalic syndrome, characterized by oculomotor paralysis and diplopia, and probably by disturbance of convergence and pathologic sleep (Pozl).
2. Metathalamic syndrome, characterized by ocular crisis, upward or downward, and absence of oculomotor paralysis and diplopia.
3. Syndrome of the luysian body, manifesting itself most frequently by lateral and not rotary deviations.
4. Toval's bundle, showing simple lateral deviation.

As I previously stated, the ocular symptoms are generally in evidence; if they are not, then one has little guidance except what is seen by other physical signs. Frequently they are so mild that one does not associate them with encephalitis. In recalling some of the patients I have seen, I now feel confident that the mild grade ocular symptoms were the end-results of a former attack.

Unless one is especially interested, it is easy to pass by insignificant symptoms and place no importance on them. I believe this holds good especially for mild attacks of encephalitis. Only when patients return years after one of these attacks and show evidence of paresis does one associate the two conditions. At times the patient has difficulty in recalling such an attack, as he has generally classified it as a mild case of grip or a heavy cold. Temporary diplopia, anisocoria, disturbance of accommodation, oscillation of the eyeball and intermittent and alternating strabismus, when no other cause may be found, on careful study, will suggest a former infection. In the mind of the laity the condition was not a mild case of sleeping sickness but an attack

of grip. Whenever possible, I try to persuade my patients to have a complete physical examination and detailed history and in quite a few instances the history of an infection that resembles the history of a mild grade encephalitis is discovered.

A few months ago I was called in consultation on a case. A tentative diagnosis was made of intracranial neoplasm; the patient had diplopia, ptosis, sluggish pupil and a disk that showed a mild grade, nonactive neuritis. Spasmodic violent headaches and dizziness were complained of. Physical examination revealed a low blood pressure. Several weeks later the patient became comatose, and in a few days died. Postmortem examination revealed no intracranial neoplasm.

I question whether sclerosis without hemorrhages could cause the aforementioned ocular symptoms. Evidence of these ocular manifestations of encephalitis must be considered in examination of the eyes for years to come, and they must not be mistaken for ocular manifestations of neurosyphilis.

The ocular symptoms may be classified as follows:

1. Ptosis, permanent, or more or less transient or partial. Spasmodic retraction and relaxation of the orbicularis palpebrarum; may be bilateral or unilateral.
2. Diplopia, crossed and homonymous.
3. Rotary nystagmus. Oscillation or quivering of the eye in association with retarded convergence.
4. Paresis of the external rectus, superior rectus and superior oblique muscles.
5. Attacks of paresis on looking upward, present at times, fatigue and embarrassment increasing the attacks, while rest may decrease them. The lesion is probably in the region of the striatum or in the coordinating mechanism of the ocular nerves. A roll-like motion of the eye may be elicited when a patient is placed in a darkened room and a concentrated light beam is directed toward the eyes.
6. Paralysis of the muscles of accommodation and convergence, or of either muscles.
7. Anisocoria, long-lasting or temporary; sluggishness of the pupillary reactions.

In some cases there remain permanent disturbances of the cerebral nerves, and among the most important are the reflexes and absolute paresis of the pupil. The Argyll Robertson pupil can no longer be considered as pathognomonic of syphilis.

In some cases one finds retrobulbar neuritis, with fields showing the existence of rings or central scotomas, and enlargement of the blind spot. Again, the scotomas may be inconstant or of a capricious shape. As regards changes in the fundus, there is some difference of opinion; when changes are seen, the lesion is probably in the primary optic ganglions. The suspicious looking fundus showing atrophic changes or, apparent evidence of a former neuritis, when associated with the other

ocular signs, seems to be closely allied with encephalitis. Optic neuritis or a papillitis is probably attributable to pressure from the inflammatory exudate on the optic tract. The changes in the cerebrospinal fluid are not sufficient to account for the pupillary stasis.

Dr. Clinton Wilson of the Wilmer Ophthalmic Institute reviewed 110 cases of epidemic encephalitis; it is of interest to know that 46 patients showed various conditions of the pupils and of the muscles of the eyes. I have tabulated the symptoms obtained from the histories. The majority of patients were from the dispensary. In two cases there was complete paralysis; in three, Argyll Robertson pupils; in one,

| | |
|---|---|
| Ptosis: | |
| Right | 6 |
| Left | 2 |
| Bilateral | 10 |
| Slight | 2 |
| Transient | 2 |
| Diplopia | 5 |
| Temporary | 2 |
| Nystagmoid: | |
| Lateral right | 3 |
| Left | 2 |
| Vertical | 2 |
| On looking up | 4 |
| Fixings | 3 |
| Anisocoria: | |
| Right, pupil larger | 7 |
| Left | 8 |
| Slight reactions | 6 |
| Rotation: | |
| Limited on looking up | 5 |
| Lateral | 3 |
| Emotional | 2 |
| Convergence | 8 |
| Limited | 3 |
| Argyll Robertson pupil | 3 |
| Ophthalmoplegia | 2 |
| Photophobia | 1 |
| Accommodation impaired | 5 |
| No accommodation | 3 |
| Fundus: | |
| Hyperemia | 2 |
| Disk haziness, nasal margins | 8 |
| Low grade neuritis | 2 |
| Retinal edema | 2 |
| Bilateral choked disk | 1 |

choked disk, and in fifteen, changes in the fundus. The ocular symptoms were more evident in males than in females. The ages ranged from 16 to 65. The data are presented in the accompanying tabulation.

The histories of the cases from the Johns Hopkins Hospital are interesting in that they fit in well with the reports from the current medical literature. Probably a greater percentage of changes in the fundus are seen in the cases from the Johns Hopkins Hospital than in those reported from different sources. The palpebral ptosis, the retardation or paresis on looking upward and nystagmoid movements are especially noted.

In reviewing some of the literature, I found no mention of ophthalmoplegia; as I have mentioned, Dr. Wilson's data included two cases. Argyll Robertson pupils were seen in three cases. With the evident

variation in the ocular syndrome from slight involvement to complete paralysis, one can readily see that there is still much to learn before a clear understanding can be obtained as to the exact changes that have brought about these varied symptoms.

If further study will substantiate the present interpretation, then the Argyll Robertson pupil as an evidence of neurosyphilis, and the impaired accommodation or paresis that is associated with a diphtheritic toxicity must be held in abeyance as a true pathognomonic condition of these two infections. The varied pupillary reactions that one finds in the size, action, tone and fixidity has given rise to a bit more caution in the association of these conditions with certain neurologic dogmas. The changes in the fundus seen in the acute and late stages will tend to confuse one's impressions with a probable intracranial neoplasm. The optic-neuritic evidence may be toxicity or it may be secondary to an exudative condition along the optic pathway.

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# HOMONYMOUS HEMIANOPSIA DURING PREGNANCY AIDED BY REFLECTING PRISM*

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Homonymous hemianopsia occurring during pregnancy in apparently healthy women is seemingly a rare condition. I have been able to find the report of only two cases in the literature, and in only one of these was the condition permanent.

Three conditions were considered as the possible cause after complete ocular and physical examination, namely, vascular lesions, hysteria and pregnancy.

Before considering the possible causes, I believe it profitable to regard the present conception of macular representation in the cortex.

## CORTICAL REPRESENTATION OF CENTRAL VISION

Moore [1] stated that central vision or macular representation is at the occipital poles, extending on to the lateral surface of the brain, for a number of cases have been observed in which the damage limited to one or both occipital poles produced, respectively, a homonymous paracentral scotoma or a central scotoma in both eyes, the peripheral fields being complete. In the unilateral injuries in which a homonymous paracentral scotoma was present, this always extended right up to the fixation point.

It has been recognized for a long time that in cases of homonymous hemianopsia due to obstruction of the posterior cerebral artery, whether by an embolus or as a result of thrombosis, the scotoma falls short of the fixation point by about 10 degrees, and this has given rise to the suggestion that each macula is represented in each cerebral cortex right and left.

In view of these facts, it is clear that this explanation can no longer be maintained. Holmes and Lister explain the escape of the macula in vascular lesions by the fact that the occipital pole is a borderland territory as regards the distribution of the posterior and middle cerebral arteries, and if one of these vessels is blocked the other will supply sufficient blood for the needs of this area of the cortex.

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* Submitted for publication, July 12, 1929.

* Read before the Virginia Society of Otolaryngology and Ophthalmology, Staunton, Va., April 27, 1929.

1. Moore, R. Foster: Medical Ophthalmology, Philadelphia, P. Blakiston's Son & Company, 1922, p. 5.

VASCULAR LESIONS

Friedenwald's [2] patient, a man, aged 35, following an operation for gallstones, complained of difficulty with vision. Two weeks following the operation the patient showed a left homonymous hemianopsia which persisted unchanged for a year. No previous case of cerebral vascular accident in anesthesia could be found in which the patient was under 45 years of age.

Sabbadini [3] saw a patient with a transitory right homonymous hemianopsia, partly absolute and partly relative, with conservation of a broad central area of vision. The author believed that this temporary disturbance was due to a vascular spasm, probably of the calcarine artery on the left side.

Morax [4] reported a case of right homonymous hemianopsia due to a tumor that compressed the occipital extremity of the left hemisphere. Five years after operation there was no evidence of hemianopsia. The author expressed the belief that the condition was the result of compression of the circulation together with compression of the visual cortical centers.

Farid's [5] patient was seen in consultation with Professor Fuchs. The patient was a man, aged 65, whose fields showed a right homonymous hemianopsia. The only positive observations were arteriosclerosis and an excessive use of tobacco (50 cigarets a day) and coffee. Treatment consisted in the use of iodides and strychnine and the cessation of smoking and coffee. Two years after onset, hemianopsia was nearly abolished. Professor Fuchs considered that the lesion was due to venous hemorrhage into the tracts on their way to the left occipital lobe, and that this had later undergone absorption.

Bannister's [6] paper is of exceptional merit, as it details the course of fugacious homonymous hemianopsia from the author's personal experience. Bannister considered this condition angioneurotic in origin, induced by temporary anemia of the cortical visual centers in one hemisphere due to a vasomotor spasm of the branches of the posterior cere-

2. Friedenwald, J. S.: Homonymous Hemianopsia Resulting from General Anesthesia, Am. J. Ophth. **8**:488, 1925.

3. Sabbadini, D.: Transitory Homonymous Hemianopsia, Riv. oto-neuro-oft. **1**:385, 1924; Ophth. Year Book, Chicago, Ophthalmic Publishing Company, 1925, p. 185.

4. Morax, V.: Regression of Right Homonymous Hemianopsia After Removal of Occipital Tumor, Ann. d'ocul. **162**:589, 1926; Ophth. Year Book, 1927, p. 188.

5. Farid, N.: A Case of Right Homonymous Hemianopsia, Brit. J. Ophth. **13**:67, 1929.

6. Bannister, John M.: Fugacious Homonymous Hemianopsia: A Clinical Study, Am. J. Ophth. **6**:396, 1923.

bral artery, the chief causes being reflex irritation, as from asthenopia in nervous persons, combined with one or more of the various foci of infection.

### HYSTERIA

Wilbrand and Saenger [7] are of the opinion that hemianopsia cannot be the result of a purely functional neurosis.

Peter [8] is of the opinion that homonymous hemianopsia may be the result of hysteria.

Garvey's [9] patient, a woman, aged 26, showed a left homonymous hemianopsia. This was considered to be of hysterical origin, as the patient had definite signs of hysteria, and all examinations gave negative results for organic disease; furthermore, the condition was completely relieved by static electricity and suggestion.

### CHANGES IN THE FIELD OF VISION DURING AND FOLLOWING PREGNANCY.

McCurry,[10] who examined seventy pregnant women during the last month of pregnancy, is of the opinion that bitemporal contraction of the fields of vision does not occur during pregnancy, while Lohlein [11] found that bitemporal hemianopsia is constant and can be demonstrated in 78 per cent of all pregnant women toward the end of pregnancy.

Finlay [12] examined thirty-one patients otherwise normal in the later months of pregnancy, and found that only nine could be considered approximately normal, the remainder showing changes in the nature of bitemporal contraction; eight showed slight changes, nine moderate changes and five pronounced changes. He attributed the changes to the normal hypertrophy of the pituitary gland that takes place during pregnancy.

Schiff-Wertheimer [13] reported one case of permanent right homonymous hemianopsia and one case at first bilateral (half an hour of

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7. Wilbrand and Saenger: Neurologie des Auges, Wiesbaden, 1900, vol. 3, p. 1043.

8. Peter, Luther C.: Principles and Practice of Perimetry, Philadelphia, Lea & Febiger, 1916, pp. 94 and 193.

9. Garvey, John L.: Hysteric Homonymous Hemianopsia, Am. J. Ophth. **5**: 721, 1922.

10. McCurry, Arthur L.: An Examination of the Fields of Vision in the Last Weeks of Pregnancy, Brit. J. Ophth. **12**:177, 1928.

11. Lohlein, W.: Die bitemporale Hemanopie der Schwangeren, Monatschr. f. Geburtsh. u. Gynäk., vol. 65, no. 3-4.

12. Finlay, C. E.: Bitemporal Contraction of Visual Fields in Pregnancy, An International Congress of Ophthalmology, Washington, D. C., 1922, p. 95.

13. Schiff-Wertheimer, S.: Homonymous Hemianopsia in the Course of Pregnancy, Bull. Soc. d'opht. de Paris, 1927, no. 3, p. 147; abstr. Am. J. Ophth. **11**:166, 1928.

complete blindness) which underwent fairly rapid retrogression of the right hemisphere so that no permanent lesion resulted, both cases occurring during pregnancy. The author attributed the lesion to a spasm of the posterior cerebral artery or of the branches.

Endelmann's [14] case of bilateral homonymous hemianopsia occurred in a woman, aged 32, without constitutional disorders, who suddenly became blind after being delivered of triplets. The patient gradually improved, but a complete right-sided and an incomplete left-sided homonymous hemianopsia remained.

### USE OF PRISMS AS AN AID IN HOMONYMOUS HEMIANOPSIA

Braunschweig [15] uses prisms with the base toward the blind area but not beyond 8 degree prisms. At a distance of 5 meters with a 7 degree prism an area of 40 cm. to the blind side is gained and in reading an area of from 3 to 4 cm. Strebel [16] used prisms up to 8 degrees in strength and obtained decided improvement in four of twelve cases.

Wiener [17] uses small prisms which are isoceles, right-angled triangles, the hypotenuse acting as a plane mirror to reflect the image to the vital portion of the retina. Since writing his article, Wiener has recommended the use of a prism over one eye only, and I believe that he means the use of the prism over the left eye in a left lateral hemianopsia and over the right eye in a right lateral hemianopsia.

Braunschweig and Strebel use prisms to bend the rays of light, while Wiener uses the prism to act as a mirror.

### REPORT OF CASE

Dr. Paul Davis of the Lewis Gale Hospital, the patient's obstetrician, has given me the following account of his examination and treatment.

Mrs. M., aged 34, presented herself at my office during the second month of pregnancy. She had one child eight years old. This child was delivered at the seventh month by accouchement forcé on account of eclampsia. Mother and baby were saved with great difficulty. For several weeks the mother could barely see on account of albuminuric retinitis. Her health for the past four or five years had been very good. She wanted another child, but was doubtful about being able to carry it to term without a repetition of the eclampsia. Examination showed her to be in good health. Urinalysis was negative, and the blood pressure was 110 systolic and 70 diastolic. She was advised to try to carry the baby, with a promise to terminate pregnancy at the first evidence of trouble.

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14. Endelmann: Bilateral Homonymous Hemianopsia After Labor, Arch. f. Augenh., 1912, p. 177, quoted from the American Encyclo. of Ophth., vol. 8, p. 5781.

15. Braunschweig, P.: Hemianopsia Aided by Prisms, Klin. Monatsbl. f. Augenh. **65**:535, 1920; Ophth. Year Book, 1922, p. 395.

16. Strebel, J.: Correction of Homonymous Hemianopsia, Klin. Monatsbl. f. Augenh. **71**:236, 1923; abstr. Ophth. Year Book, 1924, p. 273; 1925, p. 185.

17. Wiener, A.: A Device to Be Used in Lateral Homonymous Hemianopsia, Arch. Ophth. **55**:362, 1926.

Her course was entirely uneventful until the beginning of the eighth month when she called to tell me that she was practically blind, having become so at some time during the night. There was absolutely no other symptom. Examination showed nothing; urinalysis was negative and the blood pressure 118 systolic and 72 diastolic. I put her in the hospital for observation. Blood Wassermann, blood urea and blood counts were negative; urinalysis was negative; the blood pressure was 118 systolic and 70 diastolic. An x-ray picture of the teeth showed two with abscessed roots. These were extracted. The patient left the hospital in

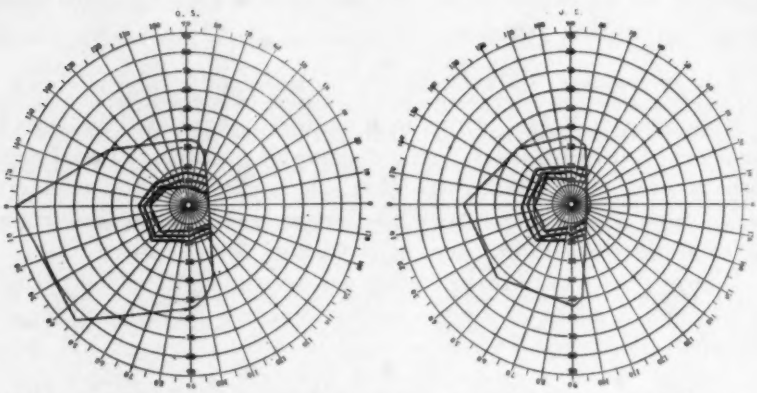

Fig. 1.—Perimeter record charts showing blind spot normal in left eye and blind spot in blind area in right eye.

Fig. 2.—Glasses worn by the patient, showing the prism over one eye.

five days with no improvement in her eye condition. One month later she returned and was delivered of a normal baby with no difficulty and no complications. She was in labor only five hours and had an exceptionally easy time.

*Ocular Examination.*—The patient was first seen on Jan. 21, 1928, five weeks before confinement, at which time the following observations were made: vision without glasses, right eye, 6/21; left eye, 6/30+1. Cycloplegia showed myopia with myopic astigmatism, and with cycloplegic correction the following vision was obtained: right eye, 6/5-2; left eye, 6/9. Near points without glasses, no. 0.5 M type, were seen by the right eye at a distance of 11 cm. and by the left eye at 8 cm. Muscle balance was within normal limits, except for 15 degrees of

exophoria at 33 cm. The convergence near point was 9 cm. External examination gave negative results. Pupillary reactions were normal to light, accommodation and consensually.

Several times an attempt was made to elicit the Wernicke sign by using a small beam of light with the slit-lamp, but the results were negative.

The tension was normal. Ophthalmoscopic examination showed numerous yellowish-white dots about the maculae in the eyes; these spots were old and were probably the result of an albuminuric retinitis that she had during her first pregnancy eight years previously.

Fields of vision showed a right lateral homonymous hemianopsia, with the preservation of from 5 to 10 degrees of the field to the right of fixation in each eye. When the hemianopsia first occurred, the patient was almost helpless; she had difficulty in getting about the house and did not go out unless she had someone with her. She also had considerable difficulty in reading.

*Treatment.*—On April 19, 1929, the patient was given her former correction with a prism, as advised by Wiener; but in this instance the prism was used over the right eye only and was so placed that it was not in her direct line of vision in the primary position, the idea being that she was to look into the prism when she wanted to see to the right, as one would in looking through the bifocal segment or in looking into the overhead mirror in an automobile. The prism has been fairly successful, and the only objection the patient has to it is its unsightliness. The prism was much more satisfactory after both the top and the bottom of the prism had been frosted, as this eliminated the spectral colors which are pronounced in an unfrosted prism.

Prisms as advised by Braunschweig and Strebel were tried, but did not help the patient.

The patient has remained well in every respect, except that the hemianopsia is permanent. It seems remarkable that this patient, who was at first almost helpless, now drives an automobile.

## CONCLUSIONS

1. Permanent homonymous hemianopsia is probably the result of vascular spasm.

2. There is no proof that this condition was the direct result of pregnancy.

3. The evidence substantiates the theory that the visual cortex receives a part of its blood supply from the middle cerebral artery, and tends to disprove the theory that each macula has bilateral representation.

4. While in the beginning, the patient was almost helpless, she later experienced little difficulty.

5. A reflecting prism put over the right eye in right homonymous hemianopsia or over the left eye in left homonymous hemianopsia, so placed that the patient can glance into it when a view to the blind side is desired, gives considerable aid and comfort.

6. The upper and lower surfaces of the prism should be frosted, as this eliminates the spectral colors which otherwise interfere with the mirror action of the prism.

# EYE MANIFESTATIONS IN FRACTURE OF THE SKULL*

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The diagnosis of fracture of the skull is not always simple, and the proper prognosis is so important that the neurologist must utilize all his diagnostic means in advising and supervising proper treatment. Not the least of the physical signs that especially give one indications of the prognosis are those observed in the eyes. Particularly when the patient is unconscious, and this is true in many cases, the eye signs are most valuable as indicators of how much brain damage has occurred and what the chances for recovery are.

The symptoms and signs from the time the fracture is received until recovery or death, in nearly all the cases, are so predominately nervous and mental that the neurologic study becomes of as much importance as the surgical considerations, if not more. The problem is neurologic rather than surgical. On the Surgical Service at Harlem Hospital, neurologic examinations in all cases of fracture of the skull were begun in 1924, and as the result of these studies, I was impressed with the frequency and importance of eye signs in these cases. Observations on the eyes were recorded as a part of complete neurologic examinations.

In 1917, Martin Cohen[1] reported his observations on the manifestations in the eyes as complications in the case of fractured skulls in seventy-five cases; his study was limited to pupillary changes and changes of the fundus. He concluded that inequality of pupils combined with loss of the light reflex is common in the fatal cases, and that lesions in the fundus are relatively infrequent. It is of especial interest that Cohen's cases were studied also on the Surgical Service at Harlem Hospital. In the present series all cases of fractures of the skull are included as causes for the eye changes, but by far the greatest number were linear fractures involving the vault and base. Many of the linear fractures were limited to the vault, according to the information given by the neurologic and x-ray examinations and the autopsy. Other fractures were of the compound, depressed, punctured or incised type. The punctured fracture was inflicted with a sharp, slender ice-pick and the incised fracture with a sharp-edged hatchet. In all the cases in

* Submitted for publication, July 17, 1929.

* Read before the Section of Ophthalmology, New York Academy of Medicine, May 20, 1929.

1. Cohen, Martin: Eye Manifestations Complicating Fractured Skull, Arch. Ophth. **46**:258 (May) 1917.

which a bloody spinal fluid was obtained (in three test tubes) the patients were considered as having subdural or pial hemorrhages, accompanied by slight punctate or greater laceration of the brain. Four cases with colorless spinal fluids were proved to be accompanied by epidural hemorrhages. A few of the cases showed combined epidural and subdural hemorrhages, as a result of linear fractures in the vault of the skull. Many of the patients were reexamined months after their injuries, and one was examined two and a half years later.

Of 610 cases of fractures of the skull studied during a period beginning in June, 1924, and ending in January, 1929, 475, or about 78 per cent, manifested eye signs, while 133, or about 22 per cent, showed none. The eye manifestations have been placed in the following groups: (1) ecchymosis and hemorrhage in the lids and conjunctivae, (2) paralysis of extrinsic eye muscles, including ptosis, (3) nystagmus, (4) pupillary phenomena, (5) scotoma and (6) changes of the fundus and the optic nerve.

### ECCHYMOSIS AND HEMORRHAGE IN THE LIDS AND CONJUNCTIVA

Hemorrhage in the eyelid and subconjunctival hemorrhage[2] are frequently present in head trauma and should always lead one to suspect a possible fracture of the skull, especially in the presence of associated eye signs. In a small percentage of the cases no other signs were observed. Ecchymosis in the eyelid was sometimes seen immediately following the fracture, and the lid in some cases became of sufficient size for the condition to be described as hematoma. More frequently, the eyelid showed no discoloration or edema until several hours following the injury, and least often there was an interval of several days before the ecchymosis became visible. The conjunctival or subconjunctival hemorrhage was less frequent than the ecchymosis in the eyelid and usually was less extensive. This hemorrhage in some cases also was seen immediately following the injury, or several hours later. The temporal side of the eyeball was more often the site of the hemorrhage than was the nasal side, and the hemorrhage was usually discrete and seldom covered a large area. A hemorrhage disappeared in a few weeks. Eyelid and conjunctival hemorrhages were observed in 106 patients in this group, or about 17 per cent of the total number of patients, and 28 per cent of those with eye signs. Of these patients, 88 showed lid or bulbar hemorrhages. Of these, 18 had no other eye signs. Both eyes were involved in 37, and one in 69. Hemorrhage in the lids alone was seen in 96, in both lids in 21 patients and in one lid in 75. Subconjunctival hemorrhage not involving the other lid tissues

2. Fuchs, H. E.: Text Book of Ophthalmology, trans. by Alexander Duane, Philadelphia, J. B. Lippincott Company, 1917, p. 428.

was present in both eyes in 5 patients and in one eye in 35. Twenty-one, or about 20 per cent of this group, died, which was about 3.5 per cent of the total.

### PARALYSIS OF EXTRINSIC EYE MUSCLES INCLUDING PTOSIS

An effort was made to exclude all cases in which direct trauma to the eyelids and eyeballs may have caused impaired motility of the muscles elevating the eyelids and moving the eyeballs. These signs usually were present immediately following the fracture, and disappeared at varying periods, from a few days to several months, afterward. The ptosis varied from slight weakness to complete paralysis, and the same was also true of the involvement of extrinsic eye muscles. More often there was an associated involvement of the constrictor pupillae muscle when the extrinsic muscles supplied by the motor oculi were affected. Other cranial nerves were affected in conjunction with the motor oculi, but involvement of the third nerve with contralateral hemiplegia of varying degree will be described in another group.

Diplopia was a frequent complaint.

There were thirty-five cases with extrinsic eye muscle signs. One showed bilateral ptosis with no pupillary changes. Unilateral ptosis of different degrees, with a dilated pupil on the side of the ptosis, was present in seven cases. Partial unilateral ptosis with homolateral divergent strabismus was present in four cases. Unilateral ptosis with no accompanying signs was seen in three cases, and ptosis of the right side with lateral rotation of the eyes to the left was observed in one case. Seven cases revealed external strabismus with a larger pupil on the same side, and one case showed a contracted pupil on the same side. One case presented a unilateral complete ophthalmoplegia with a contralateral complete facial paralysis. Bilateral convergent strabismus was present in three cases and a unilateral convergent squint in seven, one of which was associated with a complete facial paralysis on the same side. Fifteen of the patients in this group died, or nearly 43 per cent, or about 2½ per cent of the total number of patients with fractured skulls.

### NYSTAGMUS

Nystagmus was infrequently observed in this series, there being, in all, thirteen such cases. This sign was observed early and usually disappeared in a few weeks; three patients who still had nystagmus when discharged from the hospital after about three weeks were not reexamined because of their failure to return for follow-up observation. Six patients showed lateral nystagmus on lateral gaze both to the left and to the right. Lateral nystagmus toward one side was seen in three.

Rather violent oscillations of the eyeballs in all directions were observed in four patients. Although about 2 per cent of the patients had nystagmus, four of the thirteen patients who had it (30 per cent) died.

### PUPILLARY PHENOMENA

Much time was devoted to a study of the pupils. Pupillary changes were probably the most constant signs in the cases of fractured skull. The frequent changes in the size and shape of the pupils, in their direct and consensual light reflexes and in their response to convergence were most striking. An endeavor was made to use a light of nearly the same intensity in every examination. In many of the cases, examinations and notes were made as often as four or five times a day, and in the others the pupils were noted every day or every other day. Pupillary changes usually came on immediately after the trauma to the head, but the pupillary status varied with astonishing frequency. One or both pupils might assume a different size or shape, or become eccentric, within a period of a few hours. Not infrequently, a paradoxical pupillary phenomenon was observed, and this was usually unilateral. A stimulus such as pinching the skin, testing a tendon reflex or talking loudly to a semistuporous patient might alter the pupillary status markedly. Although pupillary changes were the most frequent of all the eye manifestations, the pupils usually again become normal in from a few days to a few weeks, but rarely the changes continued for several years following the injury or remained permanent.[3] Pupillary signs were observed in 378 patients, and of this number 179, or about 47.5 per cent, died. The pupillary phenomena may be grouped into eight subdivisions.

*Widely Dilated Pupils with Fixation.*—This pupillary condition was most often observed immediately following the injury, although in a few cases the pupils were seen to reach this state twenty-four hours or longer after admission to the hospital. Fifty-five patients had widely dilated and fixed pupils and of these fifty-two died (94.5 per cent).

*Widely Dilated Pupils with Preserved Reaction to Light.*—These cases were less numerous than those of the former group. Within a few hours, in these cases, the pupils frequently changed in size and outline, and not seldom assumed a normal status. The pupils in the fatal cases, with few exceptions, became fixed later. Thirty patients with this sign were seen, in all, and nine (30 per cent) died.

*Unilateral Dilated and Fixed Pupil.*—Undoubtedly, more has been written concerning the significance of unilateral dilated and fixed pupil than about any and all the other pupillary changes. It is generally

3. Kearney, J. A.: New York State J. Med. **22**:341 (Aug.) 1922.

agreed that a unilateral dilated and fixed pupil [4] is a localizing sign in an epidural hemorrhage, appearing on the side of the hemorrhage and fracture. Such has been my experience in four proved cases of epidural hemorrhage from a branch of the middle meningeal artery of the same side, but the same sign was also present in combined epidural and subdural hemorrhage on the side of the fracture, and not infrequently it was also seen in contrecoup laceration and hemorrhage on the side opposite the fracture. It has been believed that the dilated and fixed pupil is always on the side of the hemorrhage but cases with epidural hemorrhage have been reported and verified by necropsy in which the pupil was smaller [5] on the side of the hemorrhage. Unilateral dilatation and fixation of pupil is usually seen early, but this pupil may change in size and respond promptly or sluggishly to light at any time within twenty-four hours, and later it may even be considerably contracted. Twenty-two patients were observed with this sign, and eleven, or 50 per cent, died.

*Pupils Equal in Size and Not Markedly Dilated or Contracted.*—Pupils equal in size and not markedly dilated or contracted were frequently observed, and in every case the light reflex in one or both pupils was sluggish or lost, and in most cases the pupils showed an irregularity of outline. There usually was much variability in the pupillary status, with fluctuation in size from equality to inequality and back again. This group consisted of sixty-five patients and twenty-one, or 32 per cent, died.

*Pupils Unequal in Size Not Markedly Dilated or Contracted.*—Pupils unequal in size and not markedly dilated or contracted was the most common pupillary sign observed on the first examination, and it was usually associated with irregularities in the pupillary outline. Such pupils frequently remained unequal for long periods, although in most cases they were equal when the patient was discharged from the hospital. There were 121 patients with this sign, 53 of whom died (44 per cent).

*Pupils Contracted and Fixed.*—Cases in which the pupils were contracted and fixed were less frequent, and although in a few of them later the pupils widened somewhat, they rarely became much dilated. Twenty patients had this sign and fourteen, or 70 per cent, died.

*Pupils Contracted Reacting to Light.*—Contracted pupils that reacted to light were more frequently seen than the contracted and fixed pupils, and in nearly all these cases the pupils soon became larger

4. Holman, Emile; and Scott, W. M. J.: Significance of Unilateral Dilatation and Fixation of Pupil in Severe Skull Injuries, J. A. M. A. **84**:1329 (May 2) 1925.

5. Vance, B. M.: Fractures of the Skull, Arch. Surg. **14**:48 (May) 1927.

and remained so. Forty-two such cases were observed and in seventeen, or 40 per cent, the patients died.

*Partial Weber's Syndrome.*—What the neurologist knows as Weber's syndrome consists of a palsy of the third nerve with contralateral hemiplegia. This condition usually occurs with cerebral hemorrhage or tumor, but in fractured skull a condition similar to it but incomplete is sometimes observed. In none of these cases was there a complete homolateral paralysis of the third nerve and contralateral hemiplegia, but usually a dilated pupil with or without the light reflex or a dilated pupil and partial ptosis or slight divergent strabismus were usually associated with contralateral involvement of the upper motor neurons, varying from complete hemiplegia to slight hemiparesis with increased deep reflexes and lost abdominal reflexes. A positive Babinski sign was usually present. Nearly all the patients with these signs recovered with few sequelae. There were twenty-three such patients and only two, or about 8.5 per cent, died.

*Pupillary Phenomena in Prognosis*

| Pupillary Phenomena | Patients | Deaths | |
|---|---|---|---|
| | | No. | Per Cent |
| Pupils widely dilated, with fixation | 55 | 52 | 94.5 |
| Pupils widely dilated, with preserved reaction to light | 30 | 9 | 30.0 |
| Unilateral dilatation, with fixed pupil | 22 | 11 | 50.0 |
| Pupils equal in size and not markedly dilated or contracted | 65 | 21 | 32.0 |
| Pupils unequal in size and not markedly dilated or contracted | 121 | 53 | 44.0 |
| Pupils contracted and fixed | 20 | 14 | 70.0 |
| Pupils contracted and reacting to light | 42 | 17 | 40.0 |
| Partial Weber's syndrome | 23 | 2 | 8 5 |

## SCOTOMA AND CHANGES OF FUNDUS

Impaired visual fields and lesions in the fundi were rarely observed in this series. Slight engorgement of the retinal veins was the most frequent observation. The scotomas varied from a complete loss of vision in both eyes to irregular segments in either the nasal or the temporal fields of one or both eyes. Usually the scotoma was subjective—perceived by the patient—and the fields usually became normal in a few weeks, but in some instances they remained impaired for many months. Papilledema with 4 diopters of swelling was seen in one case and this was unilateral, quickly following a fracture in the frontal region that extended into the orbital plate. The papilledema was on the side of the fracture. Changes of the fundus included obstructions in the vessels causing a pallor of the disk, and hemorrhages of different sizes and in various places, including the macular region; this area seemed especially vulnerable in violent fractures of the skull. Two cases were seen in which there was primary atrophy of the optic nerve due probably to either hemorrhage within the nerve sheath or severance of the nerve. The nerve head rapidly changed in appearance and within a few days

showed extreme pallor. Papillitis with slight swelling of the vessels in the retina was sometimes present, accompanied by slight edema and obliteration of the disk margins. Eighteen such cases are here recorded, and in seven, or about 39 per cent, the patients died.

## SUMMARY AND CONCLUSIONS

Six hundred ten persons with fractures of the skull of all types were examined, and of this number 78 per cent showed eye signs. Of all these persons 39.5 per cent died, and of these about 31 per cent had eye manifestations. About 8 per cent of those who had no eye signs died. Nearly all the patients had subdural hemorrhage and either punctate or more severe lacerations of the brain. Four were proved to have middle meningeal hemorrhage together with epidural hemorrhage. Ecchymosis in the eyelids and subconjunctival hemorrhage were frequently present, and often followed fracture distant from the frontal and orbital bones. This probably was due to the explosive action of the fracturing force. Extrinsic eye muscle paralysis was most frequent in the muscles supplied by the third cranial nerve, and usually it was not permanent. Nystagmus was infrequent. Pupillary phenomena were the signs most frequently observed.

Prognosis for life in the cases with fixation of the pupils, whether dilated or contracted, was always poor. Unilateral homolateral dilatation and fixation of the pupil were present in all the cases with epidural hemorrhage. Unilateral homolateral dilatation and fixation of the pupil also frequently occurred in subdural hemorrhages. These pupillary changes were probably due to the homolateral pressure on the precentral area of the cortex rather than to injury of the motor oculi nerve at the base. Homolateral motor oculi signs with hemiplegia were positive evidence of definite cerebral injury, but not necessarily a basal injury. Changeability in the size and outline of the pupils was the most frequent eye sign in fracture of the skull. The pupillary status was normal in nearly all the patients at the time of discharge from the hospital. Scotomas and lesions of the fundus were infrequent. Papillitis and hemorrhages in the macular region were the most frequent of the changes of the fundus. Choked disk and atrophy of the optic nerve were rare. As a general rule, the patient with a fractured skull who showed eye signs had much less chance of eventual recovery than one whose eyes played no part in the clinical picture.

# THE EXPERIMENTAL PRODUCTION OF IRITIS*

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Iritis has been studied etiologically from many standpoints, but with the exception of tuberculous and syphilitic iritis, the bacteriologic phase has been rather difficult to approach. When one considers that approximately 40 per cent of all iritis is probably produced by tuberculosis and syphilis, and 60 per cent by a rather heterogeneous group of causes, it becomes obvious that an attempt to classify this large group on a causative basis would be most worth while.

Rosenow [1] based some of his ideas of the selectivity of organisms on the intravenous injection of a strain of streptococcus which caused iritis in several instances. Again he produced eye lesions (retinal hemorrhages and infiltration in the ciliary body and the iris) in the nineteenth rabbit after repeated passages of a streptococcus in the eighteen which preceded. Brown, Irons and Nadler [2] produced an iritis from the streptococcus recovered from a suppurated tear sac which was coincident with a case of iritis that was thought to be causing it. Lewis [3] produced an iritis in a rabbit by the intravenous injection of a hemorrhagic streptococcus cultured from a tooth of a patient suffering from iritis.

We wished to confirm these observations and to establish the most satisfactory method of producing experimental iritis in animals for study. Direct injection of organisms into the eye was discarded immediately, for the source of error was too great. The possibilities resulting from trauma and secondary infections were thought to be uncontrollable. Intravenous and intraperitoneal injections were considered too haphazard, for secondary foci might be started which would alter the characteristics of the organism or cause a generalized infection that would destroy the animal before the desired localization would be effected.

The technic adopted follows Finnoff's as he used it for the production of ocular tuberculosis. Under ether anesthesia, the neck of the

* Submitted for publication, July 19, 1929.

1. Rosenow, E. C.: J. Infect. Dis. **18**:403, 1915.

2. Brown, E. V. L.; Irons, E. E., and Nadler, W. H.: Localization of Streptococci, Arch. Ophth. **45**:229 (May) 1916.

3. Lewis, F. P., in discussion on Irons, E. E., and Brown, E. V. L.: The Etiology of Iritis, J. A. M. A. **81**:1775 (Nov. 24) 1923.

rabbit is clipped and shaved over the area to be used. This smooth surface is thoroughly washed with soap and water, followed by the application of a 3 per cent solution of iodine. Just before the incision is made, alcohol is dropped on the sterilized field. Under aseptic conditions, an incision is made to the side of the midline and by blunt dissection, the carotid is lifted on a strabismus hook and freed gently from its surrounding attachments. While the artery is held at moderate tension, a heavy suspension of the organism is injected from a small tuberculin syringe. The needle is held in place for about fifteen seconds and then quickly withdrawn. The artery is gently released and two silk skin sutures close the incision. A coating of collodion helps to prevent postoperative infection.

## REPORTS OF EXPERIMENTS

Miss D. T., aged 17, suffered from an acute attack of iritis in the left eye. The usual routine examinations were done, including a Wassermann test of the blood and an intradermal injection of 0.00001 mg. of old tuberculin, which were negative. The most obvious source of infection seemed to be in the nasal sinuses. Secretion from an antrum wash was cultivated on blood agar. With the exception of a small gram-negative bacillus, an almost pure culture of a hemolytic streptococcus was recovered.

Rabbit 1.—On Oct. 28, 1928, 1 cc. of a heavy suspension of the hemolytic streptococcus was injected into the right carotid of a young, well developed rabbit. After recovering from the anesthesia, the rabbit appeared to be in good condition. Twenty-four hours later, the right eye showed considerable circumcorneal injection, the vessels of the iris surface were prominent, and the pupil was much smaller than the left and irregular. Forty-eight hours after the injection, the rabbit had a violent attack of iritis, circumcorneal injection was great and the surface of the iris was gray with exudate which extended into the pupillary area and bound down the iris margin with many posterior synechia. Only a fundal reflex could be obtained with an ophthalmoscope. In seventy-two hours, the anterior chamber was filled with pus, and from then on the eye became worse until it was endophthalmitic. In ten days the eye was destroyed by the infection, but the rabbit seemed to be in good general condition and lived until Jan. 3, 1929. The left eye was cultured and sectioned, and no evidence of its inflammation was found in any part; no streptococci were recovered from any of the organs, although they were carefully cultured.

Rabbit 2.—On Oct. 28, 1928, 1 cc. of a heavy suspension of the gram-negative bacillus found in the same secretion was injected into the right carotid of a young, well developed rabbit. No iritis developed, and the animal lived for two months thereafter. Examination of the organs revealed no gram-negative bacillus. Coccidia, however, were revealed as the probable cause of death.

Rabbit 3.—On Oct. 30, 1928, 0.75 cc. of a heavy suspension of the hemolytic streptococcus was injected into the right carotid of a young, well developed rabbit. Twenty-four hours later, the eye showed considerable circumcorneal injection, the vessels of the iris surface were prominent and the pupil was small and irregular. The eye was removed at this time and sectioned. Serial sections of the posterior segment revealed no traces of inflammation in the retina, choroid or sclera, and the optic nerve was normal. No pathologic changes were noted until

the ciliary body was reached. This body displayed great leukocytic infiltration throughout, polymorphonuclears predominating. There were many plugs of exudate in the vessels. The characteristics were those of an extensive and severe iridocyclitis. The other eye remained unaffected, and the animal suffered no apparent ill effects and was alive March 14, 1929.

RABBITS 4, 5, 6 and 7.—Pus from the disintegrated eye of rabbit 1 was placed on blood agar. A hemolytic streptococcus, identical in cultural and morphologic characteristics with the injected organism, was recovered. On Nov. 3, 1 cc. of a heavy suspension of this organism was injected into the right carotid of a young rabbit. To our surprise, no change developed in the eyes. The animal remained healthy. The same culture was injected into the left side thirteen days later without results. The animal died thirty days later, and a hemolytic streptococcus was recovered from the heart, kidneys, liver, lungs and spleen. Nothing was recovered from the uveal tract of either eye. This procedure was repeated in three more new rabbits with the same result.

RABBIT 8.—After the failure of the organism recovered from the eye to produce iritis again, the original strain was tried once more. One cubic centimeter of a heavy suspension was injected into the right carotid of a new rabbit. In twenty-four hours the eyes were clear. No change was seen for three days; then a mild circumcorneal injection was noted. The pupil was slightly smaller than the left and a bit irregular. Examination of the fundus revealed nothing abnormal. In twenty-four hours the reaction had subsided. The organism had evidently lost most of its potency, at least for the eyes. The animal died four months later of an intercurrent disease. Culture of the organs failed to reveal the organism injected.

RABBITS 9, 10, 11 and 12.—One cubic centimeter of a heavy suspension of the original culture of streptococcus was injected and failed in each of the four animals to produce any demonstrable eye lesions. Rabbits 6 and 9 died in three weeks and seven weeks, respectively, and the injected hemolytic streptococcus was recovered from the liver, heart, lungs and spleen. None was found in the tissues of either eye.

### EXPERIMENTS IN COMBINATIONS

RABBIT 13.—Since many organisms owe their virulence in part or in whole to the symbiotic presence of another organism, several prevalent and apparently harmless residents of the conjunctiva were used. On Nov. 7, 1928, 1 cc. of a heavy suspension of half the original streptococcus and freshly isolated xerosis was injected into the right carotid of a rabbit. No demonstrable ocular lesions were produced, and the animal was apparently well on March 14, 1929. This procedure was repeated in rabbit 14, on Nov. 10, 1928, with the same ocular results. The animal died on December 16, of so-called "snuffles." No organisms comparable to the injected streptococcus were recovered from the organs.

### OTHER ORGANISMS

RABBIT 15.—On Dec. 2, 1928, 1 cc. of a heavy suspension of *Streptococcus viridans* was injected into the right carotid of a rabbit. No ocular manifestations resulted. The animal apparently was healthy three weeks later, and was subjected to an injection of a similar suspension into the left carotid, but it died under anesthesia.

RABBIT 16.—L. M., a man, had a chronic purulent dacryocystitis of the right eye which he said had been present for two years. The right cornea was scratched, and two days later he had a severe corneal ulcer and the eye was highly inflamed.

A bit of débris from the ulcer was cultivated on a blood agar slant and a pneumococcus type 2 was recovered. On Nov. 11, 1928, 1 cc. of a heavy suspension was injected into the right carotid of a rabbit. No ocular abnormalities resulted. The rabbit was alive and apparently healthy on March 14, 1929.

RABBIT 17.—On Feb. 2, 1929, 1 cc. of a heavy suspension of *Streptococcus viridans* cultured from a corneal ulcer was injected into the right carotid of a new rabbit. No ocular lesions resulted. The animal was healthy on March 14, 1929.

### ATTEMPTS TO PRODUCE SENSITIVITY

RABBIT 18.—An attempt was next made to produce local ocular sensitivity by repeated subconjunctival injections of a streptococcus vaccine.

A heat-killed and sterile vaccine, made from the original strain of hemolytic streptococcus, was injected subconjunctivally into a new rabbit. This animal received the following: on Nov. 28, 1928, 0.5 minims; on November 29, 0.5 minims; on November 30, 0.5 minims; on December 1, 0.5 minims; on December 2, 0.5 minims. On December 2, 1 cc. of streptococcus suspension was injected into the right carotid. The animal died on December 4, and streptococci were recovered from the spleen, heart, liver and kidneys. No evidence of iritis was found in sections, and no streptococcus was recovered from ocular tissues.

RABBIT 19.—A new rabbit received the following subconjunctival injections of the same original streptococcus vaccine: on Dec. 16, 1928, 0.5 minims; on December 17, 0.5 minims; on December 18, 0.5 minims. On December 19, 0.5 cc. of a suspension of the original hemolytic streptococcus was injected into the right carotid. There was no sign of ocular disturbance at any time. The animal died on Jan. 5, 1929. No streptococcus was recovered from any organ, but the animal had been showing distinct signs of arthritis. Sections of the eye failed to reveal any abnormalities.

RABBIT 20.—The same vaccine was used subcutaneously in the abdominal wall of a new rabbit. Four minims was injected every two days until 28 minims had been given. On Jan. 30, 1929, 1 cc. of a suspension of the original hemolytic streptococcus was injected into the right carotid. No iritis developed, and the animal was healthy and well on March 30, 1929.

### VACCINE THERAPY

A heavy suspension of the original organism was killed by heat and a vaccine prepared in 5 per cent phenol. The patient from whom the streptococcus was obtained was treated with this vaccine shortly after the first rabbit showed iritis. A large red wheal was obtained on the forearm within twenty-four hours after an intradermal injection of 0.5 minims of vaccine. There were no general or focal reactions. Another 0.5 minim was injected after twenty-four hours had elapsed and no reaction occurred. One minim was then administered in the upper part of the arm, and a slight reaction was evident. No change apparently took place in the iritis which was particularly severe. We did not feel justified in suspending all other treatment, so 1 per cent atropine was employed to prevent synechia. So far as we were able to determine, the progress of the iritis was unaffected by the vaccine.

### COMMENT

An attempt has been made to begin a systematic investigation into the mechanism of the production of iritis. While the work is far too inconclusive to establish conclusions, it suggests many interesting possi-

bilities. Iritis was produced in twenty-four hours (rabbit 1) with the strain of hemolytic streptococcus from the nasal secretions of a patient suffering from acute iritis. The organism, when recovered from the ocular tissues, failed to produce a similar condition in another animal (rabbit 2), although the original was still able to do so (rabbit 3). The recovered streptococcus from the uveal tract of an animal with iritis, when injected into a new rabbit (rabbit 4), again failed to produce ocular manifestations. Moreover, this animal lived for thirty days and, at autopsy, the organism was recovered from the heart, kidneys, liver, lungs and spleen. Nothing was recovered from either eye. This procedure was repeated three more times because it was considered a pivotal point in the work. If the recovered organism in the ocular tissues of the animal affected with a specific iritis could not produce the same condition, but could affect other organs, something must have happened to that organism in its passage through the eye or, at least, through the animal's tissues. This reaction was compared to that of the original uninjected streptococcus which had been grown artificially. The effect on rabbit 8 apparently was mild, for only a mild circumcorneal injection was seen after three days, and it cleared up on the fourth day without any treatment. This result was checked up in four more rabbits in which the original strain failed to produce any ocular lesions. Two of the rabbits died shortly thereafter, as noted, and the streptococcus was recovered from various organs, none being found in any ocular tissues. Another animal died with definite signs of arthritis.

The logical procedure was then thought to be a study of the reaction of the same organism under various conditions. Subconjunctival injections of vaccine prepared in suspensions of the streptococcus were employed in an attempt to produce sensitivity. All results were negative. The production of general sensitivity with local manifestations was attempted by means of subcutaneous injections of vaccine. These attempts likewise gave negative results. It does not, of course, follow that sensitivity was not established, for the organism had been consistently losing its potency to produce intra-ocular inflammation. On the other hand, if the vaccines produced immune bodies to start with, the animal was rendered less sensitive. This is a difficult point to decide accurately.

Apparently not every streptococcus has a predilection for the eye, as Rosenow states. The fact that the same strain of streptococcus can vary so greatly likewise agrees with Rosenow's ideas of specificity. If the organism can produce iritis it must seemingly have certain characteristics as well as be present in sufficient number.

## THE OPENING OF THE WILMER OPHTHALMOLOGICAL INSTITUTE

The opening of the William Holland Wilmer Institute of Ophthalmology at Baltimore on October 15 and 16 signifies more to American ophthalmology than the opening of a new hospital for diseases of the eye. It is the first of the new ophthalmologic foundations in this country to be opened, soon to be followed by others, though perhaps on a somewhat smaller financial scale, in St. Louis, Iowa City, Boston and, it is hoped, Chicago. These establishments should mean much to the future development of the specialty in the United States as places in which research will be encouraged and young men trained, and from which many of the teachers and investigators of the future will emerge.

A large number of prominent ophthalmologists were present, as were distinguished men and women in other lines of work. At the opening exercises, which were dignified and brief, President Ames of Johns Hopkins University presided. Herbert L. Satterlee, President of the Wilmer Foundation, Mrs. Henry Breckenridge, to whom the idea of such an institute first occurred and who started the project, and President Vincent of the Rockefeller Foundation made excellent addresses telling of the inception of the idea, its progress and final success and giving a forecast of the meaning and usefulness of such an institution. Those in attendance were then conducted through the new building, which is admirably planned for its purpose, from the isolated animal rooms on the top floor and the various laboratories, down through the operating rooms, small wards, private rooms and offices on the succeeding floors to the basement, perhaps the most interesting part of the institute, for here are placed the complete arrangements for the reception, examination and treatment of outpatients, x-rays, dark rooms for the staff and for students, a large refraction room divided into separate aisles according to the best modern practice, and a plethora of apparatus—slit-lamps, Gullstrand ophthalmoscopes, Ferree Rand perimeters and numerous campimeters. An interesting feature was the large and well equipped machine shop for the manufacture of apparatus, and the complete laboratories in which Dr. Ferree and Dr. Rand and their assistants are now established. Above on the first floor is the lecture hall and the art department, in which was shown an exhibit of plates of fundi and external conditions. Here also is a splendid ophthalmologic library and offices for the director and a number of his staff. During the afternoon Professor Fuchs gave a discourse on ophthalmology in the old world. The lecture hall was filled to the doors with a throng eager to do honor to the grand old man of ophthalmology. On October 16 Dr. de Schweinitz talked

eloquently on ophthalmology in America; this was followed by a further inspection of the institute, and finally by a most interesting talk on color vision by Sir John Parsons. With a few well chosen words, Dr. Wilmer closed the proceedings. The opening of this institute was a distinguished occasion and one long to be remembered. Dr. Wilmer is to be congratulated on what he has accomplished, and ophthalmologists look forward with confidence to the fruits of what, for ophthalmology in this country is a pioneer institution.

G. S. D.

# Ophthalmologic Review

## INTERSTITIAL KERATITIS

### A REVIEW OF SOME OF THE IDEAS ADVANCED IN THE PAST DECADE *

C. A. CLAPP, M.D.
BALTIMORE

Since Hutchinson contributed his epoch-making observation in 1855 regarding interstitial keratitis and its relationship to congenital syphilis, there has been an abundance of reports, discussions and writings on the subject. In many ways little advance has been made in the knowledge of the condition. Especially is this true from the pathologic standpoint, since tissue from cases of interstitial keratitis in human beings is exceedingly difficult to obtain for microscopic study. Whatever increase in knowledge has been made is largely the result of experimental investigations on rabbits. It seems opportune, however, to review the literature for the past ten years on this subject, including both clinical and experimental observations.

#### ETIOLOGY

Whether the corneal lesion is directly due to the presence in the cornea of the spirochetes or their endotoxins remains a matter for discussion. Two important articles have appeared, one by Igersheimer and the other by Löwenstein. The first article, by Igersheimer, is an exhaustive study of rabbits in which both direct and metastatic interstitial keratitis was produced. He was able to demonstrate the spirochetes in the corneas throughout the layers, even down to Descemet's membrane. Löwenstein, however, in a later communication could not demonstrate the spirochetes but always found a cellular infiltration about the ciliary vessels; he believed that this infiltration, by causing nutritional changes, produced the keratitis.

I produced the keratitis in rabbits at will, but my experiments were not sufficiently conclusive to confirm either of the foregoing opinions. After extensive work with rabbits, Brown was of the opinion that certain strains of the spirochetes have greater affinity for corneal tissue than have others.

Many articles have appeared in which the subject is discussed from the clinical standpoint. One interesting report was made by McDannald of a case of twins in which one twin showed a positive Wassermann reaction and had repeated attacks of interstitial keratitis.

* Submitted for publication, Aug. 5, 1929.

* From the Wilmer Institute of the Johns Hopkins Hospital.

The mother's Wassermann reaction also was positive, while the father and the other twin showed a negative reaction. Keratitis never developed in this child.

Probably the question of injury as an exciting cause of interstitial keratitis has received the greatest attention, largely on account of industrial insurance. Butler, Carmi, Cunningham, Vossius, Spicer, Rosica, Saint Martin and La Ferla are among those who have written on the subject. Butler expressed the belief that as high as 20 per cent of the cases are excited by injury and even attributed such a slight trauma as the instillation of a local anesthetic as being a cause. Spicer thought that about 3 per cent of the cases are directly associated with trauma, and Cunningham thought that 1.5 per cent are a result of injury.

While every one will agree that trauma of varying degrees may be an exciting cause in patients harboring spirochetes, one must use extreme care in giving an opinion as to the relative damage done by a foreign body or a supposed foreign body. One can easily recall that before the days of industrial insurance many patients presented themselves with the history of a foreign body in the eye which was, in reality, the first symptom of beginning interstitial keratitis and was in no way connected with injury.

There is another school of writers who consider the corneal involvement an allergic reaction, but these authors have brought forward no particular experimental proof. Enroth, Hagop and Kraupa thought that some constitutional condition is usually present which is the exciting cause. Ring and Tschernobrow reported cases in which tuberculosis seemed to have a definite bearing on the syphilitic infection, and Rothan expressed the belief that an unbalanced endocrine system is an exciting cause.

Critically reviewing this mass of material, one is led to believe that in all probability the spirochetes and their endotoxins present in the cornea are responsible for the keratitis; that trauma is undoubtedly a contributing factor that should be given proper consideration; that the presence of focal infections and disturbance of the endocrines may have an influence but that these in themselves are often influenced by the specific infection, and that the true cause of the keratitis is the spirochetes.

## SYMPTOMS AND GENERAL COURSE

Little of importance has been added to the knowledge in the description of new symptoms or of the course of the disease. Spicer's monograph contains a summary of probably the largest series of cases with a description of symptoms and course. He reported three cases in which the patients had interstitial keratitis at birth and a case of congenital syphilis in which the lesion in the eye did not develop until the age of 35.

As to the question of recurrence, Spicer's cases showed relapses in only 9 per cent, while Derby's statistics showed 38 per cent of relapses. Spicer's cases also showed that the infiltration might start centrally, peripherally, generally, superficially or deeply. The peripheral onset, however, was slightly more common, occurring in 58 per cent of the cases.

While some authors state that interstitial keratitis never shows an ulcer of the cornea, Hoffman reported such a case.

In a series of 200 cases, Uhthoff found that peripheral choroiditis occurred in 8.5 per cent. Suker wrote that the type which shows small spots with radiating areas of keratitis is probably caused by the spirochetes, while those types which are deeper and are characterized by marked striations are the result of the syphilitic toxins. These opinions, however, apparently have no pathologic basis.

## PATHOLOGY

Gilbert was able to study the eye of a 19 year old boy with typical interstitial keratitis. He found a rather marked variability in the thickness of the corneal epithelium with the usual cellular infiltration; spirochetes were not found in the cornea. Suganuma found general atrophy of the epithelial layer. Weill, Kestenbaum and Nakaizumi expressed the belief that the lines sometimes seen in these corneas are results of a proliferative inflammation.

Igershemier found endothelial thickenings in experimental keratitis in rabbits which contained spirochetes. Löwenstein found round cell infiltrations around the ciliary vessels and was unable to demonstrate the spirochetes in any case. Jaeger, on the other hand, stated that a histologic study in a case showed no changes to support a nutritional disturbance.

It would therefore seem that little has been added to the knowledge of the microscopic changes, as practically all of these observations have been previously described. I am inclined to agree with Spicer in his remark that what one needs is a series of histologic examinations of the different kinds of onset of an attack as well as examinations in the various stages. Such examinations in the human being are next to impossible, owing to the extreme difficulty in obtaining material in any stage; especially is this true in the acute stage of the disease.

From results of animal experimentation, one would judge that the general clouding is due to round cell infiltration and not to the spirochetes, which have been given as the probable cause by some. When statements are made that the toxins are responsible for some changes, the spirochetes for others and cellular infiltrations for still others, it usually means that these statements represent the authors' opinions rather than observations supported by authentic investigations.

TREATMENT

The question of therapy as applied to this condition has received more attention than any other phase. This is due, without doubt, to the popularization of certain drugs in the treatment for syphilis rather than to any especial merit in the preparation.

Langendorff recommended twelve injections of arsphenamine, which is to be followed by a six weeks' course of mercury for the systematic treatment. Downing showed by his results that when mercury and arsphenamine are used together the average time for cure is six months, while with mercury alone the average time is fourteen months. Boas also believed that this form of treatment is best, while Guy preferred to give some potassium iodide in addition. This general form of treatment is the one used for the constitional treatment in the larger number of clinics.

Bismuth as a drug of choice in combating the syphilitic infection has been responsible for a large number of articles.

Kleefeld asserted that when bismuth is used in treatment the results are better and often no vessels remain in the cornea. Lees believed that bismuth is better than mercury but less efficient than arsphenamine.

In those patients personally observed who received bismuth, it was impossible to detect any difference in the speed or the completeness of resolution over the older form of treatment.

One of the newest forms of constitutional treatment is the introduction of *Plasmodium malaria* into the system. Schreiber treated thirty-five eyes in twenty-three patients by this method. He expressed the belief, after observing this series, that the course of the disease is shortened and that the iris is more readily dilated, but that the ground glass cornea is not changed. One patient, however, developed a corneal ulcer following the sixth malarial attack, which condition required enucleation of the eye.

Under the title of "Fever Therapy," Marchesani reported fifteen cases in which typhoid vaccines were employed in treatment. He concluded that the results were better than in those cases in which this form of treatment was not given. Huber used milk, typhoid vaccines, arsphenamine and bismuth; but while his results are good, one can hardly evaluate the different types of therapy.

With Langendorff and others, I feel that the cornea clears much more rapidly in those cases of syphilitic interstitial keratitis which also show an intradermal hypersensitivity to tuberculin when tuberculin therapy is given with the antisyphilitic treatment.

With these new forms of general treatment have appeared some methods of local treatment that have not been generally adopted, chief of which is roentgen treatment of the cornea.

Bywater and Plummer recommended five minute doses at weekly intervals in conjunction with the usual treatment. Courcy and Mastier also recommended one six minute treatment per week. A stimulating dose is the one desired. Nicolle, on the other hand, recommended that the treatment be given every second day for four or five months, and he reported remarkable improvement. Raverdino recommended this form of treatment when vascularization is slow in appearing. Bussy believed that only small doses are necessary. He thinks that the rays have a selective action on the new connective tissue cells as well as on the round cells. He pointed out that only a few of the rays penetrate the spleen in leukemia, yet with this treatment the white cells diminish and the spleen becomes smaller. Bussy is thoroughly convinced that the cornea clears more quickly, that there is much less photophobia and that recurrences are less frequent. The treatment gives best results if started early in the stage of infiltration.

Other drugs which have been used locally in the eye are a brand of arsphenamine recommendel by Renshaw, and arsphenamized serum used by Seibert. Since there is little rationale in such therapy, mention alone is probably more than sufficient.

Hensen expressed the belief that the quartz light treatment gives favorable results.

## SUMMARY

1. From the etiologic standpoint one has almost sufficient proof, both experimentally and clinically, to justify the belief that the keratitis is caused by the presence in the cornea of spirochetes and their endotoxins. From a clinical standpoint, it has been found that about 3 per cent of the cases are excited by some form of trauma.

2. No particular facts have been added to the knowledge of either the symptoms or the pathology of the condition.

3. In reference to treatment, there seems to be sufficient material for the belief that in some cases the preparations of bismuth may be better than those of mercury, and that the local treatment of the cornea by the roentgen rays in the early stages has resulted in sufficient improvement to warrant continued trial. It is questionable whether the use of malarial inoculations has shown enough evidence of improvement in the results to justify the danger involved.

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# News and Notes

EDITED BY DR. JOHN HERBERT WAITE

## GENERAL NEWS

**Howe Medal Awarded to Prof. T. Axenfeld.**—The Howe medal of the American Ophthalmological Society was awarded this summer at the International Congress of Ophthalmology at Amsterdam to Prof. T. Axenfeld of Freiburg.

**Minnesota Indians Examined.**—A clinic for the examination of Minnesota Indians was held the first half of September at Cass Lake. Indians throughout the state were examined by five clinicians whose recommendations for treatment would be administered by local reservation physicians.

**American Academy of Ophthalmology and Otolaryngology.**—The annual meeting of this society was held at Atlantic City, N. J., October 21 to 25, 1929, under the presidency of Dr. Harris P. Mosher, Boston, with headquarters at the Hotel Traymore. The guest of honor was Dr. Herbert Tilley, London, England. A symposium on abscess of the brain was presented by Dr. William L. Benedict, Rochester, Minn.; Dr. Wells P. Eagleton, Newark, N. J.; Dr. William J. Mixter, Boston, and Dr. Harry P. Cahill, Boston. Among other numbers on the ophthalmic program was "The Report of the Research Fellow in Ophthalmology" by Dr. Daniel B. Kirby, New York. The instructional program consisted of conferences similar to those conducted for the last two years, each being limited to twenty participants; twenty-five rooms were reserved on the first floor of the hotel for the conferences, so that each was held privately and all interference was avoided. Most of them were repeated so that all might attend any given subject. A charge of $1.00 was made for each morning conference, but there was no charge for the afternoon conferences with unlimited attendance. Arrangements were made for gold tournaments and for the annual banquet, at which George H. Parker, professor of zoology, Harvard University, Boston, spoke on "Heredity."

# Abstracts from Current Literature

EDITED BY DR. WILLIAM ZENTMAYER

## Anatomy and Embryology

CONTRIBUTION TO THE DEVELOPMENT OF THE HUMAN CORNEA. N. E. ISRAEL, Am. J. Ophth. **12**:469 (June) 1929.

The author gives several descriptions of the corneal development in different embryos, with seven illustrations. She holds that contrary to the view of Mann the cornea is derived from specially differentiated cells probably of endothelial origin. Mann believes that the cornea is derived from mesoderm directly.

W. S. REESE.

## Refraction and Accommodation

CHANGES IN THE REFRACTION OF THE EYE. EDWARD JACKSON, Am. J. Ophth. **12**:361 (May) 1929.

A brief but interesting history of errors of refraction is given and 729 private case records are analyzed, in each one of which the state of refraction was tested over a period of ten years or longer. These are arranged in four groups: A, patients under 20 years of age; B, those between 20 and 40; C, those between 40 and 60, and D, those more than 60 years of age. In each of these groups the different forms of ametropia were segregated, as myopia, hyperopia and regular astigmatism. The following table is an abstract of the article:

| | Age Group | | | |
|---|---|---|---|---|
| Spheric Refraction | A | B | C | D |
| Total cases | 123 | 356 | 214 | 36 |
| No change | 28 | 34 | 24 | 4 |
| Increased myopia | 19 | 49 | 25 | 3 |
| Decreased myopia | 9 | 36 | 18 | 1 |
| Decreased hyperopia | 38 | 90 | 71 | 18 |
| Increased hyperopia | 29 | 154 | 79 | 9 |
| Increased refraction | 57 | 139 | 104 | 21 |
| Decreased refraction | 38 | 190 | 97 | 10 |
| Astigmatism | | | | |
| Total cases | 114 | 338 | 202 | 35 |
| Increase | 62 | 154 | 105 | 15 |
| Decrease | 9 | 90 | 43 | 13 |
| No change of axis | 38 | 94 | 44 | 1 |
| From 90 degrees | 27 | 198 | 148 | 32 |
| Toward 90 degrees | 8 | 9 | 3 | 2 |

W. S. REESE.

## Methods of Examination

NOTE ON THE CONTINUOUS EMPLOYMENT OVER A PERIOD OF YEARS OF SOLID ATROPINE AND COCAINE FOR CHILDREN'S REFRACTION. E. THOMSON, Brit. J. Ophth. **13**:366 (July) 1929.

The refraction of some 10,000 children was satisfactorily determined after the use, usually, of a single tabloid composed of atropine hydrochloride $\frac{1}{200}$ grains and cocaine hydrochloride $\frac{1}{200}$ grains. The tabloid is not effective every time as might be expected considering the preponderating number of astigmatic cases. Assuming a dozen cases, the greater number astigmatic or presenting high errors,

one case on an average might require further atropine. Should the accommodation not be paralyzed in from one to one and one-half hours, atropine ointment is usually given for home use, the ointment being omitted in the morning of the second examination when a tabloid is again applied. No harmful effects were noted.

W. ZENTMAYER.

## Experimental Pathology

CHALCOSIS OF THE CORNEA. G. LODDONI, Arch. di ottal. **57**:329 (June) 1929.

The author, whose previous work on chalcosis of the lens was recently reviewed in the ARCHIVES (June, 1929), now takes up the clinical and experimental phenomena observed in the cornea of eyes containing copper. Copper has been demonstrated in the blood and all the organs of man and the lower animals. It must be considered a normal constituent of the organism, although its function in the animal economy is unknown. Zanda has found it in the aqueous, lens and vitreous of the common animals, and found that when colloidal copper was injected intravenously, an appreciable deposit occurred in the eye. The present author found copper distributed in the normal human eye in varying amounts, distributed in order as follows: sclera, cornea, vitreous, choroid, lens, iris, ciliary body and optic nerve. For the whole eye, he calculated that copper was present in a proportion of 1 : 1,000,000.

The author placed fragments of copper in various parts of the eye and investigated the eye histochemically after various periods. He used chiefly a 1 per cent hematoxylin solution in testing for copper, which gives a characteristic blue color in dilutions of 1 : 1,000,000. Copper placed subconjunctivally produced moderate inflammation, resulting in encapsulation of the fragment without any deposit of copper elsewhere in the eye.

Jess has described the clinical and histologic appearance of chalcosis corneae in eyes containing copper, as due to a deposit of copper granules in a ring near the limbus, in a layer between Descemet's membrane and the parenchyma. The author examined with the slit-lamp many patients with trachoma and animals treated with copper, but did not see the deposit of copper in the cornea described by Sallman as occurring frequently under such conditions. In his experiments with copper introduced in the anterior chamber and the vitreous, the copper showed little tendency to diffuse into the parenchyma, but localized chiefly in the endothelium and on Descemet's membrane near the limbus, forming a ring such as Jess described in his cases. The endothelium was extensively degenerated. A small amount of copper was seen in the parenchyma next to Descemet's membrane, but the epithelium and most of the parenchyma remained free. The localization around the periphery represents, according to the author, a deposit of metal due to a slowing of the circulation in the anterior chamber near the avenues of exit of the aqueous. The toxic changes in the endothelium due to copper are more pronounced in this region. As a result of the chemical inflammation set up in the eye, the copper was often eliminated through the wound of entrance in the cornea or sclera. When the foreign body is in the anterior chamber, a means of diagnosis as to its nature is afforded by dropping 1 per cent hematoxylin in the conjunctival sac; the conjunctival secretion collected on a pledget of cotton will then be blue, due to elimination of copper with the aqueous. When the fragment is in the vitreous, this succeeds less often. Aqueous removed by paracentesis gives a definite reaction in such cases.

The characteristic ring-shaped localization of copper in the corneal endothelium near the limbus is in sharp distinction to the localization of iron, which lodges

in the epithelium as well, and produces no ring-shaped opacity. While, as a rule, copper produces more severe inflammation in the eyes than iron, there is a tendency for small fragments of copper to become encapsulated by connective tissue; they may then be well tolerated for years.

SANFORD R. GIFFORD.

THE REACTION OF THE HUMAN EYE TO PUNCTURE OF THE ANTERIOR CHAMBER. A. J. SAMOJLOFF, Arch. f. Ophth. **122**:139 (May) 1929.

In a case of sarcoma of the choroid in the upper part of the fundus, the author performed a puncture of the anterior chamber and enucleated the eye twenty-seven hours after the puncture. He found marked hyperemia of the choroid and of the ciliary body. The cells of the ciliary epithelium were edematous; some small vesicles could be found between them. Fibrinous exudate filled the anterior chamber. Clinically, not the slightest symptoms of inflammation or of hyperemia were present at the time of the enucleation. The reaction of the human eye to the puncture of the anterior chamber is not essentially different from the behavior of the animal eye. Hyperemia, edema of the epithelial cells, slight hypertony and increased protein content of the regenerated fluid are present in both.

P. C. KRONFELD.

## Conjunctiva

OBSERVATIONS FROM ROUTINE BACTERIOLOGICAL EXAMINATIONS OF CONJUNCTIVITIS CASES. S. H. MCKEE, Am. J. Ophth. **12**:475 (June) 1929.

The author makes the following conclusions from a large series of cases: 1. Acute conjunctivitis in the Montreal area is generally due to the pneumococcus; second, to the bacillus influenzae. 2. Koch-Weeks conjunctivitis is seldom seen. 3. The pneumococcus form varies a great deal in severity from season to season. 4. An epithelial smear is often useful in the pneumococcus infections. 5. By far the most prevalent form in this area is the Morax-Axenfeld. It is a chronic catarrhal form but not infrequently is seen in a most acute form. It is met with during the winter and may be complicated by corneal ulceration or absorption iritis. 6. Diplobacilli may be found constantly in the noses of these patients. 7. We have in sulphate of zinc a specific for this form of infection.

W. S. REESE.

BEHAVIOR OF THE IRIS AND INTRA-OCULAR TENSION OF THE CAT AFTER EXPERIMENTAL CONTUSION. G. TESSIER, Ann. di ottal. e clin. ocul. **57**:299 (April-May) 1929.

Previous work on this subject is referred to, especially that of Weekers, who observed a regular rise of tension involving also the other eye, in rabbits after contusion.

The author, in his experiments, which were conducted with cats, used a lead weight of 200 Gm., which was allowed to fall on the cornea from measured distances. All contusions produced a miosis of short duration which, in the more severely traumatized eyes, was succeeded by mydriasis.

This seldom lasted longer than one and one-half hours, and permanent paralysis of the sphincter was never produced. Curves of tension taken every five minutes usually showed a hypertension proportionate to the severity of the contusion, but never reached over 40 mm. This occurred within the first fifteen minutes, and lasted from twenty-five to forty minutes. In a few eyes, a slight hypotension was observed. The change in tension always also affected the opposite eye, which was

not traumatized. Eyes submitted previously to a weak electric current showed a hypotension after contusion. The extreme degrees of hypertension observed in the rabbit by Leplat after contusion apparently do not occur in the cat. (Bibliography.)

SANFORD R. GIFFORD.

## Cornea and Sclera

THE RADIATIONAL TREATMENT OF CORNEAL ULCERS. W. S. DUKE-ELDER, Brit. M. J., July 13, 1929, p. 41.

This is a subsequent report on the author's additional experience in the application of ultraviolet light to ophthalmology, in particular a report on the results of radiational treatment applied locally to ulcerative conditions of the cornea. The action of ultraviolet light on the cells in the tissues of the eye is first described. With a small intensity, the cells are injured. A greater intensity causes destruction; this is followed by repair, which is to be desired in the treatment of ulcers of the cornea. The therapeutic effect of ultraviolet light in pathologic changes in the cornea, the author explains as follows: Pathologic micro-organisms in the superficial layers are killed, the superficial cells are cast off, vascular reaction at the limbus with resulting emigration into the corneal tissue produces bactericidal activities and rapid, healthy regeneration of the exfoliated epithelium, and, finally, the local immunologic mechanism is favorably influenced.

The serious effect of ultraviolet light on the lens makes it essential that in local phototherapy the lens must be excluded from the path of incident rays. These conditions are met in the author's ophthalmic radiation lamp (*Brit. J. Ophth.* **9**:67, 1927), and the way it is employed is described. The exact dosage is elaborated and the reaction on the part of the cornea given. The author states that under clinical indications, every kind of corneal ulcer responds favorably. Ultraviolet light is especially indicated in the severer corneal ulcers, such as hypopyon ulcer, in which better results are obtained than by cauterization. Chronic ulcers are often made to heal over, and the deep lesions of acne may be favorably influenced. Morever, recurrent and phlyctenular ulcers show the beneficial effect of this treatment. In the phlyctenular group, ultraviolet light is best employed with general light baths. Old corneal opacities are not influenced. Recent opacities may be improved, and treatment of ulcerations by light noticeably prevents the formation of opacities.

A. KNAPP.

THE APPEARANCE OF PERSISTENT KERATOCELES. EMMA SCHINDLER, Ztschr. f. Augenh. **68**:22, 1929.

A keratocele is most frequently encountered in deep-seated corneal tumor masses in which the corneal tissue has thinned out considerably. As a rule, perforation is imminent in these cases. Schindler describes a case of keratocele in which the summit was about 2 mm. and the diameter, 3 mm. The curvature could not be measured accurately. The tissue of the keratocele was from one-fifth to one-fourth the thickness of the surrounding tissue. The lesion was located paracentrally. The area was not fully transparent, and pigment remnants of an old uveitis were present. The vision with a —1.00 sphere was 6/60. The author believes that the persistence of this condition was due to the strong Descemet's membrane and organized cicatricial tissue. The keratocele fluctuated back and forth with diastole and systole of the heart. It protruded in systole and contracted in diastole. The corneal lesion followed keratitis rosacea.

A. M. YUDKIN.

## Lens

AN INQUIRY INTO THE OCCURRENCE AND EFFECTS OF VOMITING AFTER CATARACT EXTRACTIONS. F. M. LAW, Brit. J. Ophth. **13**:353 (July) 1929.

After detailing the routine treatment of patients with cataract at Moorfield's Eye Hospital before and after operation and the means taken to combat untoward effects of vomiting occurring after operation, the author gives a brief abstract of cases in which this complication arose. In 15 of 141 cases, vomiting occurred, a proportion of 10.6 per cent. Of these 15 cases, 12 or 13.3 per cent were in female patients. Ill effects on the operated eye as an apparent result of the vomiting occurred in 5 cases, a proportion of 33.3 per cent. Actual prolapse of the iris occurred in 2 cases, a proportion of 13.3 per cent. In the majority of cases when vomiting occurs, it does so within three days of the operation. Of the 141 cases under consideration, 10, or 7.6 per cent, showed a prolapse of the iris in the days immediately following the operation, for no discoverable reason. Of these 7, or 70 per cent, were females. Vomiting after operation for cataract is of far less severe consequence than is generally supposed. It is rare for any harm to come to the eye operated on. Little is gained by rigid treatment after operation. The preponderance in females may prove that it is a purely nervous phenomenon. The addiction of females to the use of purgatives may cause a chronic irritation of the gastro-intestinal mucosa, which in time of exceptional strain may reveal itself in vomiting.

W. ZENTMAYER.

EXPERIMENTAL TETANY CATARACT. H. GOLDMANN, Arch. f. Ophth. **122**:146 (May) 1929.

The author made extensive and careful slit-lamp studies on animals after experimental removal of the parathyroid glands. In rats and in dogs, opacities of the lens occurred only if muscular symptoms of tetany were present. If the muscular symptoms were avoided (calcium lacticum by mouth), the lenses remained normal. Hyperemia of the anterior ciliary vessels seemed to favor the development of opacities of the lens. Miotics and mydriatics had no definite influence. In rats an intimate connection between the attacks of convulsions and the appearance of opacities in the lens could be observed. After the first attack, fine gray points appeared immediately beneath the anterior capsule of the lens. If all further attacks were avoided, most of the fine opacities disappeared, while moving a little toward the center of the lens. If further muscular attacks were allowed to take place, the primary gray dots developed into gray vacuoles. These vacuoles were small in the axial parts of the lens and became larger toward the periphery. The vacuoles grew and formed small tubes. The whole opaque layer gradually moved away from the surface of the lens. The fibers around the vacuoles were destroyed too. The slit-lamp picture of the tetany cataract in dogs was principally the same as that in rats. The opacities of the lens were interpreted as the reaction of the living lens fibers to an acute intoxication. The gray dots which occurred in rats and dogs as the first symptom of lesions of the lens were the opaque ends of lens fibers and not lesions of the epithelium, because they were found in the posterior subcapsular layer of the dog, which has no epithelium. The opaque layer always formed a new zone of discontinuity.

The clinical picture of the tetany cataract in rats was entirely different from that of the thallium cataract. Therefore, the author concluded, the thallium cataract had nothing to do with a lesion of the parathyroid glands.

The author was able to measure the growth of the lens by estimating the velocity with which the primarily subcapsular opacities divided down into the more central parts of the lens. It sometimes occurred that fibers which had been injured when they were near the surface became opaque when they had moved in a more central layer of the lens.

P. C. KRONFELD.

## Retina; Optic Nerve

CASE OF EXTERNAL EXUDATIVE RETINITIS. S. L. OLSHO, Am. J. Ophth. **12**:453 (June) 1929.

The author gives the etiology and pathology of this disease as described by Coats. He reports the case of R. G., a single woman, aged 19. The patient's mother had died at the age of 36 of inoperable brain tumor; the father had died of a stroke at the age of 74. The maternal grandfather and two aunts had died of tuberculosis. The father's sister, the mother of a blind child that died in early infancy, was herself blind and died as a young adult. Several children in an uncle's family died young. Two brothers and four sisters were in good health. The oldest sister, aged 34, had a bilateral retinitis pigmentosa said to date back to the age of 9 years. The personal history was negative, the patient's general health being perfect. The hemoglobin was 76 per cent, red cells 4,520,000, leukocytes 7,200 with polymorphonuclears 62 per cent, lymphocytes 35 per cent, mononuclears 1 per cent and basophils 1 per cent. The Wassermann reaction was negative; the blood chemistry was normal. Urinalysis, x-rays of the chest, sinuses and head, physical examination and two Pirquet examinations gave negative results. The blood coagulation time was three minutes.

Friends observed a peculiar bright reflex from the left eye about September, 1928, but the patient did not come for consultation until March 1, 1929. At that time vision was right eye, $\frac{20}{15}+$; left eye, $\frac{10}{200}$ in a restricted field. The external appearance was normal except for a peculiar light reflex from the left pupil. The pupils were 4 mm. and round; the left was sluggish to light directly, and the right was sluggish consensually. The nerve head of the left eye was hazy in appearance with poorly defined edges especially below and laterally. The vessels could be traced to the center of the disk obscured by haze. The veins were full, and the arteries were thin. The lower three fourths of the fundus was seen as a homogeneous, soft, yellowish-white, opaque surface, raised almost uniformly about 1.5 diopters, extending as far as one could see toward the ora serrata except nasally. The upper border of this area exhibited undulations and was lost nasally in an incompletely coalesced collection of yellowish-white islets. The retinal vessels were in front of this large mass and were free from haze except at points near and on the disk. They passed back and fourth from the mass to normal retina. In the lower, outer periphery of the fundus there was an increased number of good sized venous and arterial branches, and in one case an anastomosis of a small vein and artery. The inferior temporal vein became extremely thin for a short distance and then bifurcated. These bifurcations were extremely tortuous and presented several small coils and one circumscribed glomerulus-like coil of new vessels. The artery in this region had a tortuous course and terminated with a glomerulus-like coil of new vessels. There were a number of other small tortuosities and fusiform swellings in this region as well as short coiled branches.

W. S. REESE.

THE MARKED SUSCEPTIBILITY OF THE REGION OF THE POSTERIOR POLE IN DISEASES OF METABOLISM AND IN CIRCULATORY DISTURBANCE. F. SCHIECK, Arch. f. Augenh. **100-101**:857, 1929.

This author is of the opinion that the pathologic changes seen in the fundus in diseases of the cardiorenal system are due chiefly to the raised general blood pressure. He shares this view in common with Verney as opposed to the opinion of Volhard who believes that the main damage to the retina is due not to the elevated blood pressure but to the constriction of the finer retinal arterioles. (The high blood pressure itself Volhard attributes to the generalized constriction of all the arterioles throughout the body.)

Schieck maintains that the high blood pressure causes a leakage of serum and diapedesis of blood cells through the vessel wall, and these in turn cause the typical ophthalmoscopic pathologic condition. As evidence of this he reminds us that often the entire fundus may clear up by absorption of exudates and hemorrhages leaving no trace of the former pathologic process. Were the damage caused by a necrosis of tissue due to arteriolar constriction, Schieck maintains it would not be possible for it to clear up.

In order to support his point of view, Schieck is forced to explain why the greater part of the pathologic condition is limited to the posterior pole of the eye. This he does by the following reasoning:

The region of the macula is the most active physiologically and therefore must have the greatest metabolism. This calls for the largest supply of blood, and since it is well known that this particular region is actually least supplied with blood vessels, it must be assumed that the vessels in this region are more freely permeable than those in the periphery. This being the case, one can easily understand why a greater leakage of serum and cells occurs here when the general blood pressure is elevated.

FRANCIS HEED ADLER.

THE ETIOLOGY OF RETINAL DETACHMENT, R. GREEF, Arch. f. Augenh. **100-101**: 116, 1929.

Greef reports two cases of retinal detachment for which no cause could be found other than gout. Under appropriate treatment, which consisted of sweats, meat-free diet, cinchophen, etc., one of the patients recovered. The author explains the detachment on the basis of a deposition of urates in the sclera similar in kind to the deposition in the joints, tendon sheaths, etc. This leads to an inflammatory process in the choroid and an outpouring of serum which detaches the retina.

FRANCIS HEED ADLER.

## Neurology

PITUITARY TUMORS WITH FULMINATING SYMPTOMS. J. E. BENJAMIN, J. A. M. A. **92**:1755 (May 25) 1929.

A married woman, aged 63, as a child had a right apical tuberculosis. After adolescence she had attacks of mental depression and on one occasion rather alarming circulatory symptoms. She had never been known to perspire.

At the time of the present attack, she was apparently in good health. She awoke one morning with a terrific pain in the temporal part of the head, extending over the eyes. The following day backache, drowiness, fever and vomiting were present. Two days later there was palsy of the third and sixth nerves on the right side and partial palsy of the third nerve on the left side. In the right field an inferior hemianopic defect was present, and in the left field, a relative central

scotoma. The fundi were normal. Two years previous to the present illness, a roentgenogram taken because of symptoms of sinus trouble showed widening of the sella. The same condition with erosion of the posterior clinoid processes was now found.

On the fourth day, the patient seemed blind. After a second spinal puncture, coma with high temperature developed. At operation, a tumor was exposed behind the chiasm. A considerable portion of it was removed. Immediately thereafter the temperature rose to 107 F., and death ensued.

The postmortem diagnosis was hemorrhagic and necrotic malignant hypophyseal adenoma eroding into the sphenoidal sinus.

The author thinks it quite likely that the tumor was present two years previously, but as there were no physical symptoms a diagnosis of tumor could not be made. He points out that the extreme suddenness with which the condition arose and progressed—headache and nausea and sudden blindness within thirty-six hours in a well person is certainly uncommon. He queries whether the functional symptoms noted early have any bearing on the abnormalties of the pituitary gland which later developed into a tumor. The ophthalmologic report is by D. T. Vail, Jr.

W. ZENTMAYER.

THE TRANSMISSION OF VON RECKLINGHAUSEN'S DISEASE. E. ACKERMANN, Ztschr. f. Augenh. **67**:141, 1929.

The author reviews the history of a family in which the father showed the definite ocular disturbance found in von Recklinghausen's disease. At an early age his son presented small neurofibromas on his body but none on the tissue of the lid; later he developed glaucoma in both eyes. A sister of the patient had small nodules on her face and body and also showed a disturbance of the catamenia. From a study of this family history and the cases reported in the literature, Ackermann notes that von Recklinghausen's disease does not follow a typical course in all patients. The disease may manifest itself in solitary tumors or in café au lait spots. A psychic disturbance is usually present in all cases. The manifestations of the disease are usually enhanced by some sort of trauma.

A. M. YUDKIN.

## Ocular Muscles

THE RELATION OF VERTICAL DIVERGENCE AND ROTATION, BOTH OBTAINED BY FUSION. W. HERZAU, Arch. f. Ophthl. **122**:59 (May) 1929.

The author describes Tschermak's modification of the haploscope of Hering. With this instrument the author measured the amount of vertical divergence and of rotation which were brought about by the tendency of fusion if the two half images were shown at different height and rotated toward or away from each other. The author corroborated the observations of Hoffmann and Bielschowsky that the amount of vertical divergence obtained by fusion can be gradually increased by systematic exercises, that after these exercises a certain amount of the vertical divergence remains for a few hours so that the examined person is not able to fuse half images which are shown on the same vertical level. For rotation the author used Duane's terms; conclination for a rotation of the upper pole toward the nose, and disclination for a rotation of the upper pole away from the nose. The amount of vertical divergence which was obtained after long exercises, was 4 to 5 degrees, the amount of rotation, obtained in primary position of the eyeballs was 13 to 14 degrees. Then the author tried to combine the two movements by showing the two half images with some difference in the vertical level and tilted toward or

away from each other. He showed that the two movements together took place to just the same amount as if just one had been required by the tendency of fusion. That is a strong argument for the theory of Tschermak that the vertical motors are able to cooperate with each other in two different ways. The right rectus superior cooperates with the right superior oblique if rotation without vertical motion is required. On the other hand, the right rectus superior muscle cooperates with the right inferior oblique muscle if elevation without rotation is required. These two actions take place independently of each other. The rectus superior muscle can be used for both actions at the same time without any interference in the two single actions.

P. C. KRONFELD.

## General Disease

AFFECTIONS OF THE EYE IN LEPROSY. A. R. CREBBIN, Am. J. Ophth. **12**:384 (May) 1929.

The ocular conditions in leprosy are discussed, and a case of progressive iridocyclitis is described in a patient discharged from a government institution as cured but in whom the bacillus was later found in a scraping from the foot. The sight of both eyes was eventually lost.

W. S. REESE.

EYE LESIONS IN PATIENTS WITH POSITIVE WASSERMANN REACTIONS. F. H. RODIN and J. G. CARSON, J. A. M. A. **93**:369 (Aug. 3) 1929.

Of 1,000 consecutive patients with positive Wassermann reactions seen in Stanford University medical clinics, 286 were seen at the eye clinic. Of these, 100 had ocular lesions which were considered of syphilitic origin. Of this number, 51 were first seen at the eye clinic and 49 were referred from other clinics. There were 26 male and 24 female patients. The greatest age incidence occurred between 40 and 50. Practically every pathologic condition of the eye was present. The lesions most frequently found were optic atrophy, Argyll Robertson pupils, interstitial keratitis, iridocyclitis and ophthalmoplegia interna. In the series of patients with positive cerebrospinal reactions there was a preponderance of degenerative lesions, such as optic atrophy, Argyll Robertson pupils, ophthalmoplegia interna and paralysis of the ocular muscles. The authors conclude that a routine examination of the eyes of all patients with a positive Wassermann reaction of the blood is advisable, and that a Wassermann test is indicated whenever the etiology of an ocular condition is unknown or doubtful.

W. ZENTMAYER.

VON RECKLINGHAUSEN'S DISEASE: A CASE OF NEURINOMA AND NEUROMA RACEMOSUM OF THE UPPER LID. F. L. CANDIAN, Arch. di ottal. **57**:362 (June) 1929.

The literature on the subject is extensively reviewed. The author reports the case of a boy, aged 17, with a typical growth of the upper lid, resulting in complete ptosis. It extended to the frontal and temporal regions; the characteristic feeling of a mass of worms in palpation was less marked in these regions. The lobe was normal. The swelling had gradually increased since infancy. Operative removal of the mass with some loose skin was followed by ectropion; this was later relieved by excision of the tarsus, which was much hypertrophied. Sutures placed according to Hess' method relieved the ptosis. No recurrence was noted after one year. Sections showed the mass to consist of thickened and tortuous nerves embedded in connective tissue. The nerves were much thickened by pro-

liferation of the sheath of Schwann, the nerve fibers themselves passing, showing proliferation only in a few cords, while in others they were completely degenerated, owing to the proliferation of the Schwann cells. This leads the author to classify his case as one of neurinoma due to proliferation of the cells of Schwann's sheath, accompanied by proliferation of the surrounding connective tissue, and hence distinct from neuroma racemosum, in which the nervous elements themselves play the principal part. He believes that many cases previously classified as neuroma were so-called because of faulty interpretation of the histologic picture, and that they were really neurinomas. Proliferation of different elements in individual cases accounts for the varying picture in the group of cases called von Recklinghausen's disease. (A bibliography, photographs and microphotographs are included.)

SANFORD R. GIFFORD.

## Tumors

BASAL CELL PAPILLOCARCINOMA AT THE LIMBUS. J. FEJER, Am. J. Ophth. **12**:484 (June) 1929.

The case is reported of a woman, aged 50, who was first seen in August, 1928. She stated that two years earlier a small red spot surrounded by a white halo had begun to develop on her left eye. Her whole eye slowly became red and the nodule gradually spread over the entire cornea until the vision of the eye was completely lost. Examination showed a normal right eye. The lids and lacrymal apparatus of the left eye were normal, but the tarsal conjunctiva was injected. On the upper, inner limbus was a grayish-red, vascular, soft, fleshy structure the size of a hazelnut with an irregular cauliflower-like surface. A thin bridge led to a mass of similar appearance and like consistency which straddled the lower outer corneal margin like an epaulet. The whole cornea except the upper outer quadrant was obscured by pannus-like formation. Vision was reduced to light perception.

The tumor was removed and its base cauterized with the galvanocautery. A diagnosis of basal cell carcinoma was made by Professor Johann. Thorough general examination revealed no evidence of metastases. Roentgen treatment was given and a few weeks later the cornea had become much clearer. There were two small metastases at the lower outer limbus but these later disappeared. The patient in this case, therefore, up to the present time appears to be cured.

W. S. REESE.

SARCOMA OF THE CILIARY BODY DEVELOPING IN THE ANTERIOR CHAMBER. E. HARTMANN, Ann. d'ocul. **166**:264 (April) 1929.

Sarcoma of the ciliary body is not rare, but its development in the anterior chamber is infrequent.

In the case reported by the author, numerous laboratory examinations gave the following results: Wassermann reaction (four times), always negative; reaction to the Hecht test, positive three times, and the tuberculous antigen reaction, positive three times. The examination of the blood showed no alteration in the number of the globules or in their normal proportion.

A diagnosis of tumor of the anterior chamber was made, and a piece was excised for study through an incision at the lower limbus, where the tumor was situated. Examination showed it to be an apigmented sarcoma with numerous figures of karyokinesis. It originated in the ciliary body, infiltrated through some of the layers of the cornea and grew out into the anterior chamber.

Evolution of sarcomas toward the anterior chamber was not the only reason for publishing this case report; attention was also drawn to the mistrust in certain laboratory observations, when they are in contradiction to the indications found by a clinical examination.

HUNTER SCARLETT.

EARLY DIAGNOSIS OF TUMORS OF THE CHOROID. V. MORAX, Ann. d'ocul. **166:** 377 (May) 1929.

Two cases of sarcoma of the choroid were diagnosed from the appearance of a slight elevation of the retina at the posterior pole, without any vitreous changes, and the presence of a central scotoma. A detachment of the retina in each case extended from the macula to the ora serrata.

The author wished to call attention to the possibility of the early diagnosis of tumors of the choroid, before the extension of a detached retina, or the development of hypertension rendered the diagnosis certain. He thought that the changes in the retina itself were not sufficient to justify a diagnosis of choroidal tumor, but the existence and persistence over several months of a scotoma, indicating a grave alteration in the function of the retina, added to the former, were two symptoms on which to make a diagnosis.

Autopsies of the eyes confirmed the ophthalmoscopic observations.

HUNTER SCARLETT.

DETACHMENT OF THE RETINA HEALED BY IGNIPUNCTURE. A. VOGT, Klin. Monatsbl. f. Augenh. **82:**619 (May) 1929.

Spontaneous detachments of the retina are the most frequent; those found in axis-myopia and old age predominate over the traumatic ablations. Of all types the prognosis is most favorable in those caused by inflammation; they often reattach spontaneously after months or years. Detachment, according to Leber, is due to "pre-retinitis" with formation of a detaching membrane. Gonin, Hanssen and Vogt found ruptures of the retina to be the cause. This is certain in trauma when the rupture occurs mostly in the peripheral portions. The hole is found in the retina covering the upper portion of the globe. Total detachment is rarely found when the rupture occurs in the lower portion. The specific weight of the retina is the deciding factor.

Slit-lamp examinations of myopic eyes suggest that the more solid portions of the vitreous (Salzmann's "vitreous bases"), which are partly adherent, may cause the pull (see fig. 335 in Vogt's "Slit-Lamp Atlas"). The weight of these formations rather than "scar-strings" of the vitreous cause the detachment in these cases. Blessig's vacuoles, observed in persons with myopia and in aged persons, form another cause. Holes may form here analogous to those present in cystoid degeneration of the macula. There is a parallelism between senile and myopic degeneration, the latter occurring at an earlier age. Hence, the detachment may happen as a result of degeneration without inflammatory processes, as stated by Leber. Trauma may hasten the development of the detachment, even that caused by a light blow on the eye or head or an apparently unrelated fall. One patient with myopia suffered a detachment as a result of the sudden starting of the train in which he rode. The retina, raised 8 diopters above the level of the disk, became reattached and vision became normal again after the patient had rested in bed for a year. Other causative factors are gymnastic exercises or long rides in trains or automobiles. The rupture may not be located at once, or it may not be discovered in cases of long standing. Ruptures, located

peripherally, cannot always be detected with the ophthalmoscope. Pressure on the area of the ora serrata after Tranta may reveal and make available for examination a greater portion of the periphery.

Cautery by means of the snare or needle has been practiced for about forty years. Gonin, however, was the first to close the rupture itself by ignipuncture, having located it with the ophthalmoscope. The cautery is introduced through an incision into the sclera closest to the location of the rupture. It is useless to make an ignipuncture unless the rupture has been found. Results can be obtained only when the rupture itself or an area in its close proximity, 1 or 2 papilla diameters away from it, has been touched by the thermocautery. Closure of the hole is essential. The operation is performed under the guidance of the ophthalmoscope. Previous attempts to treat an eye render good results rather doubtful but possible. This is illustrated by one of Vogt's cases in which the rupture remained almost entirely open; vision, however, was satisfactory a year later. The prospect is unfavorable when the rupture is situated at the top of a large detachment. In three cases of this type the results were failures, although the ruptures could be reached. Vogt thinks that the operation was done too soon in these cases. It might have been more successful, had he waited until lowering of the detached part might have been obtained by treatment. Examination by red-free light of the edges of the ruptures is of great value by contrasting them with the choroid. The size of the rupture, of course, is of consequence. Ragged edges may offer greater difficulty. Multiple ruptures may develop during a certain period, even during the treatment as a result of small resistance of the retina.

In operating it is essential to indicate the meridian of the location of the rupture by marking it according to Gonin's suggestion, so as to avoid an error by rotating the globe when grasping it with the fixation forceps. The difficulty of locating ruptures, especially their latitude, i. e., their distance from the posterior pole or the ora serrata, is not greatly diminished by using Lindner's method. Gonin's method seems to be more exact (see *Ber. d. deutsch. ophth. Gesellsch.*, Heidelberg, 1928). He obtains his figures by taking 8 mm. as the distance between the limbus and the ora serrata. Vogt bases his calculations on the distances from the disk and the macula. The localization of the rupture is rendered difficult if it is very small or if the retina is partly reattached and folded. Peripheral location and opacities of the vitreous or lens are likewise disturbing.

Other technical problems have to be solved: the duration of cauterization, the temperature of the cautery and the depth into which it should be introduced, how hemorrhages can be avoided and whether a needle is preferable to the thermocautery.

Four of eight patients operated on by Vogt have obtained good vision lasting over one year and a half so far. Judging from his experiences, Vogt expects satisfactory results when the rupture is ophthalmoscopically visible and when it is not too large, nor too far distant from the choroid. The present stage of this operation allows no conclusions as to whether ruptures, reached by the cautery, will always heal, nor regarding the results obtained in multiple ruptures. It still remains to be determined whether the prognosis is considerably worse in large ruptures than in small ones, and whether it is worth while to proceed in cases of progressive development of multiple ruptures. Consideration of these problems will prevent an undue optimism which endangers any new method. The fact remains that many cases would have been lost without the exploitation of Gonin's idea. Twelve excellent colored pictures of ruptures of the retina are included in the article.

K. L. STOLL.

## Operations

A Suggestion for a New Glaucoma Operation. H. Mauksch, Ztschr. f. Augenh. **67**:313, 1929.

Mauksch believes that a permanent auxiliary passageway of the aqueous humor from the anterior chamber can be accomplished by inserting the iris with its adherent pigment epithelium between the adjacent scleral tissue and ciliary body and that the suprachoroidal space offers better elimination than the usual scleral exits. His operation varies slightly from the usual cyclodialysis. He separates the conjunctiva and episcleral tissue about 10 mm. from the limbus on the temporal side above, then exposes the sclera by pushing down the conjunctival tissue to about 4 mm. from the limbus and grasps the sclera with an Elschnig forcep 4 mm. from the limbus slightly to the temporal side of the vertical meridian. Somewhat peripherally to the fixed area the sclera is cut to the uvea by a parallel incision to the limbus for about 4 or 5 mm. The ciliary body and its tissue are separated from the sclera in one fourth of its area with a spatula. The sclera is entered with a curved iris forceps which is directed between the sclera and the ciliary body reaching into the anterior chamber. (The sclera is fixed with the forceps throughout the whole operation.) The iris is grasped and pulled upward into the pocket made by the sclera and the ciliary body. The iris must not be brought into the scleral wound. The fixation forceps are released and the bulbar conjunctiva stitched. Atropine is instilled, and the eye is bandaged. When the eye is observed after the operation, there is a coloboma extending temporally to the scleral wound, and the anterior chamber here is deep.

A. M. Yudkin.

## Therapeutics

Some Clinical Observations on Levoglaucosan (Links Glaucosan) and Aminglaucosan. E. C. Ellett and R. O. Rychener, Am. J. Ophth. **12**:368 (May) 1929.

The authors refer to Hamburger's work and give the following summary and conclusions: 1. An epinephrine substitute, levoglaucosan, lowered the tension transiently in five cases of simple glaucoma, while in five cases the condition was unaffected. One patient was permanently aided. In no case was the tension permanently lowered by the use of glaucosan alone. 2. Another epinephrine substitute, aminglaucosan, failed to reduce tension in six cases of acute glaucoma. It contracted the pupil slightly in one case. 3. Levoglaucosan was of material aid in breaking adhesions in twenty-two cases of acute iritis or uveitis. It reduced tension in two cases with an accompanying secondary glaucoma. 4. Levoglaucosan is of no value in separating old adhesions of the iris. 5. Levoglaucosan did not break any adhesions of the iris to the point of injury in the cornea, lens capsule or lens cortex in six cases, though in two of these it did break up posterior synechiae.

W. S. Reese.

# Society Transactions

EDITED BY DR. GEORGE S. DERBY

## NEW YORK ACADEMY OF MEDICINE, SECTION OF OPHTHALMOLOGY

THOMAS H. JOHNSON, M.D., *Secretary*

*May 20, 1929*

BERNARD SAMUELS, M.D., *Chairman*

A CASE OF ACNE ROSACEA KERATITIS. DR. RAYMOND E. MEEK.

A woman, aged 60, consulted Dr. Meek on March 11, 1929, for relief from a stubborn inflammation of both eyes, intermittent in nature, and associated with inflammation of the skin of the nose and cheeks, the symptoms having been present for six months. The patient gave a history of constipation, chronic gastritis, extraction of all the teeth, menopause at the age of 52, the habitual use of tea and coffee and the occasional use of beer.

Acne lesions were present on the nose and cheeks, the eyelids were red and swollen, and there were superficial lesions of each globe. The right eye showed a phlyctenule-like mass in the conjunctiva midway between the corneal margin and the internal canthus, with a clear cornea and a normal slit-lamp picture of the anterior segment. The left eye showed at 4 o'clock near the limbus a non-staining corneal infiltrate, with several large blood vessels in the adjacent conjunctiva. The anterior segment of the left eye by slit-lamp showed no other abnormalities. Ethylmorphine hydrochloride was tried without success. Relief was obtained with the use of sulphonated bitumin, N.F., ointment with atropine.

Dr. Meek stated that acne rosacea keratitis is a condition of the eyes rarely seen in this country, but when seen it is always associated with acne rosacea of the face. He recited the opinions expressed about its etiology; namely, digestive disturbances due to excessive use of alcohol, tea or coffee, or to the menopause, feeble circulation, trophic disturbances and intranasal infections, along with many others. He stated that the immediate response to treatment was usually favorable, but that the ultimate prognosis was usually discouraging because of the tendency toward recurrence. Lowenstein's effort to produce experimental lesions in the rabbit by means of inoculation of the cornea with material from rosacea nodules was described, with his deduction that a rosacea virus was probably the underlying cause of the disease. Finally, the observations of Weidler, Chance, Troncoso, Shirmer and Griscom were noted with respect to location of the lesions, lack of tendency to perforate, forms of treatment and associated conjunctival injection.

DISCUSSION

DR. ELBERT S. SHERMAN: A few months ago, a New York dermatologist (Rulison) called attention to the ineptness of the term acne rosacea. Acne and rosacea are two distinct diseases, although sometimes associated. Acne is characterized by the presence of seborrhea, comedones and pustules; rosacea by erythema, telangiectases and papules. Acne is found on the face, neck, shoulders and back; rosacea on the middle third of the face. Acne occurs during the second and third decades of life; rosacea seldom before the fourth decade.

Keratitis ex acne or rosacea is rare, occurring not more often than once in 5,000 or 6,000 ordinary cases of disease of the eye. Sherman saw several typical cases in twenty years' time. Dermatologists are uncertain concerning the etiology, and they feel that gastro-intestinal disturbances do not account for all the cases. Rosacea should be treated to shorten the duration of the keratitis. It is useful to dust chemically pure mild mercurous chloride on the affected eye.

A Contracted Orbit and Optic Canal, Due to a Lack of Development on Account of a Small Eyeball. Dr. H. H. Tyson.

A. C., a girl, aged 11, came under observation at the Knapp Memorial Clinic during February, 1918, when 3 months old. At that time a diagnosis was made of pseudoglioma of the left eye due to a metastatic iridochoroiditis following pneumonia associated with meningitis. While the patient was under observation during the succeeding years there was an arrested development of the left eye and orbit, associated with hydrocephalus. Recently, roentgenograms of the skull and of the orbits were made by Dr. Goalwin, which showed the skull to be very large, and of the nearly globular shape characteristic of hydrocephalus, with a noticeable difference between the sizes of the two orbits and of the two optic canals. The right orbit measured 4.2 cm. high and 3.9 cm. wide, while the left orbit measured 3.6 cm. high and 3.3 cm. wide. The diameters of the optic canals were, right 3.9 by 3.9 mm.; left, 3.1 by 3.6 mm. The left orbit and optic canal were smaller probably owing to a lack of development on account of the small left eyeball. Contraction of one orbit was demonstrated by Schuller in one case after an eye had been enucleated in infancy; but no mention has been made in the literature so far observed of contracted optic canals in these cases. The asymmetry of the orbits had produced a small amount of plagiocephaly, the median plane of the skull being inclined to the left, beginning at the lower level of the orbital margins. The sella turcica was somewhat distorted owing to the deformity of the skull. The lateral sinuses were almost at the lowest level of the skull; otherwise, the base was fairly normal in size and shape.

The interesting point in this case was the existence of the contracted optic canal, as demonstrated by the films.

Blue Sclerotics. Dr. Arthur Knapp.

A. L., a girl, aged 4, was brought to the eye service of Dr. Agatston at the Sydenham Hospital Dispensary because of the blue discoloration of her right eye. She had had this condition since birth, the deep coloration never changing. During this time, she had had no treatment.

Her previous history was essentially negative. There was no history of fracture, dislocation, strain or deafness. Development had been normal.

In the family history, on the maternal side, a grandmother, an aunt and the mother, had blue sclerotics. Each of them showed patches of bluish discoloration, variously distributed over the sclerae. Those of the child's mother did not show any increase in coloration or number over those of the grandmother. The paternal side of the family was free from this anomaly. A younger sister, aged 2, was likewise normal. There was no history of consanguinity; nor did a careful investigation of both the maternal and the paternal family histories reveal any evidence of congenital defects, except as noted. Chronic disease was absent in any member of the patient's family.

Nothing of note was revealed by physical examination. Complete roentgen ray examination of the skeletal structures did not show any lesion or defects of the bones. The Wassermann and the Kahn blood reactions were negative. The

calcium content of the blood was in the high normal range. Because of a thinning of the drum membrane of the ears, this patient had had her ears examined carefully by an otolaryngologist, with negative results. This thinning of the drum membrane was thought to be associated with otosclerosis and deafness in later life.

The results of the ophthalmologic examination were as follows: There was no buphthalmos or backward development of the eyes. The axis of the eyes was normal. Vision in both eyes was good, so far as could be ascertained. There was a conspicuous slate-blue discoloration of the sclera of the right eye, which was in marked contrast with that of the left. This abnormal pigmentation was darker anteriorly from the border of the ciliary body. There was a patch of sclera comparatively normal in color circumscribing the limbus for 0.5 cm. The pupil of this eye was equal to that of the left and regular, and it reacted well to light and in accommodation. The cornea and the anterior chamber appeared normal; there was neither embryotoxon nor bulging of the cornea. The iris was dull brown. The lens was normal. There was no muscular imbalance. Tension to palpation was normal. The eye was hyperopic. The left eye showed a slight blue discoloration of the sclera, with a few darkly pigmented patches in the region of the limbus. In other respects, the eye was normal. Ophthalmoscopic examination of the fundi did not reveal any pathologic change. The disk was not oval, nor was Fuchs' coloboma present.

The question as to the etiology of this condition is a moot point. Two theories generally obtain to explain the anomaly. One is that there is an increased transparency or translucency of the sclera; and the other is that there is an increase in the pigment in the pigmented cells of the sclera. Those who hold to the former theory believe that there is a lack of fibrous tissue in the sclera; still others think that there is an absence of lime salts, and that this deficiency explains the lack of fibrous tissue.

This case was presented because of its unusual interest and rarity.

Dr. Agatston gave permission for the presentation of the case and also invaluable help in its preparation.

CORECTOPIA. DR. ARTHUR KNAPP.

R. G., a boy, aged 5, born in Porto Rico, was referred to the eye clinic of the City Hospital Dispensary because of his stumbling and falling when he played. The family history was negative. His previous history was negative, except for the aforementioned complaint. He had never suffered from any inflammatory ailment of his eyes; nor had he ever been operated on.

The results of the ophthalmologic examination were as follows: Vision in each eye was good, so far as could be determined. The most conspicuous feature of the eyes was the eccentric pupils, both of which were displaced temporally and somewhat superiorly. They were small, the right being slightly larger than the left. The reaction to light and in accommodation was good. The nasal side of each iris was arranged in radiating folds and appeared to be stretched toward the pupil. To the temporal side of each pupil was a little band of iris tissue continuous with the rest of the iris above and below; but nasally, this band was reflected anteriorly in the direction of the cornea.

Both eyes were prominent. The lids and conjunctivae were normal. Over the temporal portion of each pupillary area of the cornea was a vertical, linear opacity, making a small crescent. The anterior chamber appeared shallow. There was no muscular imbalance.

Tension with the McLean tonometer was, right eye, 85; left eye, 70.

The fundi were normal; no coloboma of the choroid was present.

The slit-lamp showed changes as follows: In the right eye, a deep white line was seen including a small segment of the cornea, about one fifth of its width. To this white line, the iris was adherent, being almost in contact with the cornea between the limbus and the white line. From the white line toward the center of the pupil, a small part of the iris was seen reflected backward. In the left eye, The pupil was displaced higher up. There was also a white line, of smaller size than that in the right eye, and including a smaller crescent of the cornea toward the limbus. Another white streak was seen on the lower edge of the pupil. The iris was adherent to the cornea and reflected onto this white line exactly as in the other eye.

Gonioscopic examination showed changes as follows: In the right eye, the pupil was seen displaced toward the temporal side, ending abruptly and simulating a coloboma toward the limbus. A narrow strip of the temporal part of the iris was seen reflected against the cornea and then coming down. The ciliary processes were apparent, and the orbiculus ciliaris and the edge of the lens were clearly seen. In the left eye, there was the same appearance, but the pupil was smaller.

The latter analysis made the diagnosis one of corectopia rather than coloboma, since there was a band of iris tissue peripheral to the pupil, which was displaced temporally.

The etiology of this anomaly is not definitely known. There are two theories, one favoring a developmental condition, the other, a fetal iritis. This case seems to fall into the latter category. Dr. M. Uribe Troncoso did the gonioscopic examination. Dr. Wiesner gave permission for the presentation of the case.

PROLAPSE OF THE LACRIMAL GLAND. DR. JAMES W. SMITH.

J. T., aged 21, first examined on Feb. 4, 1929, gave a history of recurrent drooping of the left upper eyelid ever since an attack of whooping cough at the age of 8. At intervals, the left eyelid became reddened and painful, the palpebral fissure became narrow and a purulent secretion exuded from the inflamed left conjunctiva. The last inflammatory attack occurred in March, 1928, following a laceration of the left upper lid and left side of the nose.

Examination at the first visit revealed a corrected visual acuity of 20/20 in each eye. When the upper lids were compared, the right showed an overlapping fold of skin which did not encroach on the palpebral fissure, while the left showed a fold of skin large enough to cover the palpebral fissure everywhere, except nasally, producing an apparent narrowing thereof. The skin of each upper lid was of normal color, wrinkled as in ptosis adiposa and provided with slightly injected superficial veins. Raising of the eyelids readily exposed the palpebral lobe of the right lacrimal gland, and the palpebral and orbital lobes of the left lacrimal gland. The left lacrimal gland could easily be palpated through the redundant skin.

The urinalysis, the blood chemistry, the Wassermann reaction in the blood, the differential blood count and the basal metabolism were normal. There was a marked hypertrophy of the labial mucous membranes and of the submucous tissue of the mouth, from lips to gingivae. The x-ray showed an absence of frontal sinuses, and shallow orbital roofs, even more shallow than is usually found with absent frontal sinuses.

On February 21, the left upper lid became acutely inflamed, and the patient had considerable pain over the region of the left lacrimal gland. The lid tissues were swollen and tense, closing the temporal half of the palpebral fissure, and there was chemosis of the bulbar conjunctiva temporally and superiorly. Both lobes of the lacrimal gland were tender on palpation, and greenish-yellow pus

exuded from the gland at the junction of the two lobes. After the application of hot compresses, 3 cc. of pus was easily expressed from the gland, after which the patient had relief from all symptoms within forty-eight hours. Weekly smears from the conjunctival sac, taken for one month after this attack, yielded neither pus cells nor bacteria.

The diagnosis of blepharochalasis was ruled out because of the absence of degenerative changes in the skin, and because of the fact that the drooping of the eyelids did not extend completely across the width of the lid. The author's diagnosis, subject to exploratory operation to be reported later, was: acquired prolapse of the entire left lacrimal gland, and prolapse of the palpebral lobe of the right lacrimal gland.

DISCUSSION

DR. ARNOLD KNAPP: I had the opportunity of seeing this patient some time ago through the courtesy of Dr. Smith. If the principal lesion is the displacement of the lacrimal gland, why would it not be proper to transplant fascia lata in order to accomplish a double purpose: first, to close the gap in the tarso-orbital fascia and thereby preserve and anchor the lacrimal gland; second, to hitch up the upper lid and thereby counteract the drooping of the redundant skin?

QUADRIGEMINATE PLATE TUMORS: THEIR CLINICAL AND ANATOMIC FEATURES (LANTERN SLIDES). DR. JOSEPH H. GLOBUS.

This paper will be published in full.

VARIOUS TYPES OF OPHTHALMIC LENS CORRECTIONS. DR. MAX POSER.

In discussing principles of vision, one must consider that the human eye does not represent a stationary optical system, but is rotating in its socket around a point situated approximately in the center of the eyeball.

In cases of ametropia requiring a corrective lens, one must consider that such a corrective lens is fitted in a fixed position in front of the ametropic eye, and that if such a patient is looking at objects not directly in front of him, the eyes rotate, but the spectacle lens remains stationary. As a matter of fact, only a portion of the spectacle lens is made use of at the time the patient is looking at an object, namely, that portion in line with the pencil of rays passing through the pupillary area in order to form a clearly defined image on the fovea. It is therefore evident that when one looks through the central, intermediate or marginal portion of the lens, the entire surface of the lens must be free from optical defects if one is to obtain satisfactory results. This fact, of course, has been known for many years.

The ideal lens should image any far distant object within the range of the eye on the far point sphere, so that no matter in what direction the eye looks, it will always see objects undistorted and with the same sharpness of definition as in the case of objects situated near the center of the field.

Two aberrations cause deterioration of the image furnished by a lens situated in front of the moving eye and render the field more or less useless, unless care has been taken to correct them. They are distortion and astigmatism. A simple positive lens has the defect of producing increasing magnification as the pencils pass through the lens nearer and nearer the margin. A negative lens has the reverse effect.

Mathematically expressed, the lens has no distortion when

$$\frac{h_1}{h_2} = \frac{H'_1}{h'_2} \text{ or } \frac{\tan w_1}{\tan w_2} = \frac{\tan w'_1}{\tan w'_2}$$

Forms of lenses could be made which would produce an image free from distortion, but this result could be reached only by a sacrifice of the more important correction, namely, that for astigmatism.

The amount of astigmatism for the same field depends on the shape of the lens and its distance from the center of rotation of the eye, which is a point situated approximately at the center of the eyeball. For the same lens, it becomes greater the nearer to the margin the pencil passes through the lens.

This scientific investigation led to various forms of ophthalmic lenses, culminating finally in the Punktal lens series. "Contra generic" surfaces are employed with high-class corrected lenses — one convex and the other concave — and the astigmatism created by one surface of the lens can be corrected by an equal and opposite amount of astigmatism on the other lens surface. To achieve this result, it is necessary to select for any given lens two curves — one for the front and the other for the back surface — that bear the required relationship to each other. To correct a toric lens for the spherical and cylindric powers, however, is not possible with a lens made out of one piece of glass.

These facts were fully recognized by Professor Gullstrand and von Rohr, and therefore the decision was formed to correct the astigmatism for the entire field of the lens rather than neglecting this important factor in favor of making a partial correction, to suit the curvature of the far point sphere. By this method of ophthalmic lens correction, the actual focal length of the lens is gradually increasing from the center toward the margin.

Some years ago, Professor Gleichman in Germany advocated a series of lenses so constructed that the average curvature of the field for the spheric power of each lens would be the same as that for the far point sphere of the eye for which it was designed. These lenses were less deeply curved than the astigmatically corrected forms of the Punktal lens series, and so they were less expensive to manufacture, but they failed to attain much popularity. They had the fault common to all lenses which are not corrected for astigmatism up to the marginal zone in that they themselves introduced a cylindric error in oblique pencils, which, as is well known, the eye is unable to overcome.

Other corrected lenses have been designated for the purpose of making a compromise between the form of lenses advocated by Gleichman and the form of the truly astigmatically corrected Punktal lens. Such lenses, no doubt, are superior to the Gleichman lens, coming somewhat nearer to the correction of the Punktal lens.

In spectacle lenses, astigmatism in oblique pencils can be corrected, as has already been seen in the design of the Punktal lens series, but owing to the numerous special tools required in the manufacture of Punktal lenses, the equipment proved to be too costly to be installed by dispensing opticians, etc., and therefore the dispensing opticians were compelled to purchase the finished lenses from the manufacturer, thus entailing, in many instances, considerable delay in filling prescriptions.

This fact was fully realized by American manufacturers, and special research work was undertaken in order to see whether methods could be simplified to meet the demand made by dispensing opticians that an astigmatically corrected lens series of high quality be created which could be surfaced by the dispenser, thus speeding up the filling of prescriptions.

This research work, which, with numerous experiments, extended over more than eight years yielded a new series of astigmatically corrected ophthalmic lenses, which can be surfaced by the dispensing optician. With these new lenses, it was

found possible to introduce a smaller number of curves than is employed in the Punktal lense series, without interfering with the accuracy of their performance for all practical purposes.

In the research work done at Rochester, it was found that many aberrations afflict the marginal points of the field of view, but it has been generally accepted that the most serious of these is astigmatism. There are differences of opinion as to just what type of correction leads to the best result. In addition to the correction of astigmatism, however, the corrected lens is assumed to be more accurate as to the focus and possibly in other respects than the ordinary run of lenses.

The astigmatism in oblique pencils consists in the tendency of the lens to form along any oblique axis not a single image, but two, which we shall call T and S. The disposition of these two images is controllable by the designer of the lens within the range of power from —22 to +8 diopters. In order to influence the position of the image, it is necessary to vary the shape of the lens and, in general, there is only one practical shape that will produce the desired type of correction.

If the manufacturer of a corrected lens series pays attention to the elimination of astigmatism in oblique pencils, such lenses must be considered superior to those in which this important correction is more or less neglected. The slight alteration of focus in such lenses toward the margin is easily compensated for by the accommodation of the eye of the patient, so that the patient when looking through such lenses sees the image of an object as if it were coincident with the far point sphere.

EYE MANIFESTATIONS IN FRACTURES OF THE SKULL. DR. GEORGE A. BLAKESLEE.

This paper appears in full in this issue, p. 566.

GENERAL CONSIDERATION OF THE EYE IN DIABETES MELLITUS. DR. MARTIN COHEN.

This paper appears in full in this issue, p. 529.

DISCUSSION

DR. ERNST WALDSTEIN: After Dr. Martin Cohen so thoroughly covered his subject, there is nothing of importance for me to add, but I would like to mention one or two items which may not be devoid of interest.

Dr. Cohen's second case, that of an old woman affected with big ulcer of the cornea which necessitated enucleation of the eyeball, reminded me of a case I had a few weeks ago. A woman, about 65 years old, came in with a so-called catarrh or marginal ulcer of the cornea, without having a real catarrhal conjunctivitis. After physical examination the patient's urine was examined, and it showed sugar. Evidently these cases are not rare, and it is necessary not only to do a urinalysis, but also to determine the blood sugar content, in order to rule out diabetes; otherwise, such small ulcers may prove dangerous.

The second item I would like to mention is the retinitis circinata; these cases are known to be much rarer than the normal diabetic retinitis. It struck me that the first case of circinate retinitis that I saw as a young intern at the hospital many years ago was that of an old man with chronic diabetes. I have seen perhaps a dozen patients in the meantime with retinitis circinata, and at least one of

them was diabetic. This number is small; just the same, I think that diabetes is an important contributing factor in the etiology of retinitis circinata.

The third item is one which Dr. Cohen mentioned himself, and which I emphasized when some noted guest from the West read his paper about modern treatment of glaucoma before this meeting two months ago; that is, the antagonism of diabetes and glaucoma. If one bars the cases of secondary glaucoma due to the rapid swelling of a diabetic cataract, there seems to be no question that the cases are rare in which diabetes and glaucoma coexist. Diabetes, because of the hyperacidity of the whole system, is a safeguard against glaucoma.

DR. THOMAS H. JOHNSON: Three or four years ago I had as a patient an old lady who scratched her eye with a briar while walking through some brambles. She was chronically diabetic, and when I saw her she had a hypopyon keratitis. She was immediately put on a course of insulin treatment and given a diabetic diet, but a secondary glaucoma developed and after about two weeks the eye had to be enucleated.

DR. ERNEST F. KRUG: I would like to ask Dr. Cohen if one is to assume from what he said that there is not a typical diabetic retinitis, and if the changes seen in the eye are vascular changes which can occur only when there is present arteriosclerosis or some other vascular disturbance with the diabetes? Dr. Cohen mentions that often the diabetes improves, but the picture in the fundus gets worse. This is true. I have seen it in two typical cases with hemorrhages continuing and the pathology of the fundus advancing, while the patient's blood sugar was reduced and his general condition was improving. What interests me is to hear once more whether Dr. Cohen wishes to imply that the fundus picture one is accustomed to call diabetic retinitis is not necessarily characteristic of diabetes.

DR. MARTIN COHEN: I wish to infer that there is a typical appearance which I tried to outline. I stated that the basic factor for the characteristic picture is the presence of vascular lesions in the retina. It is known that glycosuria can alter the retinal picture, but cannot alter it unless there is primarily a lesion of vascular walls. In many of the cases of lipemia retinalis, in which there is a marked hyperglycemia and the retinal picture is typical, the lesions did not show any alterations of vascular wall; this would indicate that the metabolic changes are not entirely responsible for the diabetic retinitis. As there are many borderline cases of the diseases mentioned difficult to differentiate, the vascular lesion associated with the existing disease might indicate a better clinicopathologic entity.

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## AMERICAN OPHTHALMOLOGICAL SOCIETY

EMORY HILL, M.D., *Secretary*

*Sixty-Fifth Meeting, June 10 to 12, 1929*

WALTER R. PARKER, M.D., *Chairman*

A CASE OF EPIBULBAR BASAL CELL CARCINOMA WITH PENETRATION OF THE GLOBE. DR. BEN WITT KEY, New York.

A rare pathologic and clinical picture of unusual interest was presented, especially so far as location and extension were concerned. The character, symmetry

and direction of the malignant process suggest a mechanical influence in its rapid progress into and within the globe.

The growth arose at the angle of the nasal commissure; it advanced rapidly, similar to an infection, and penetrated the globe along the course of the ciliary vessels.

DISCUSSION

DR. E. C. ELLETT, Memphis, Tenn.: C. R., aged 42, first seen in May, 1920, had a vascular growth at the temporal limbus of the right eye, which was said

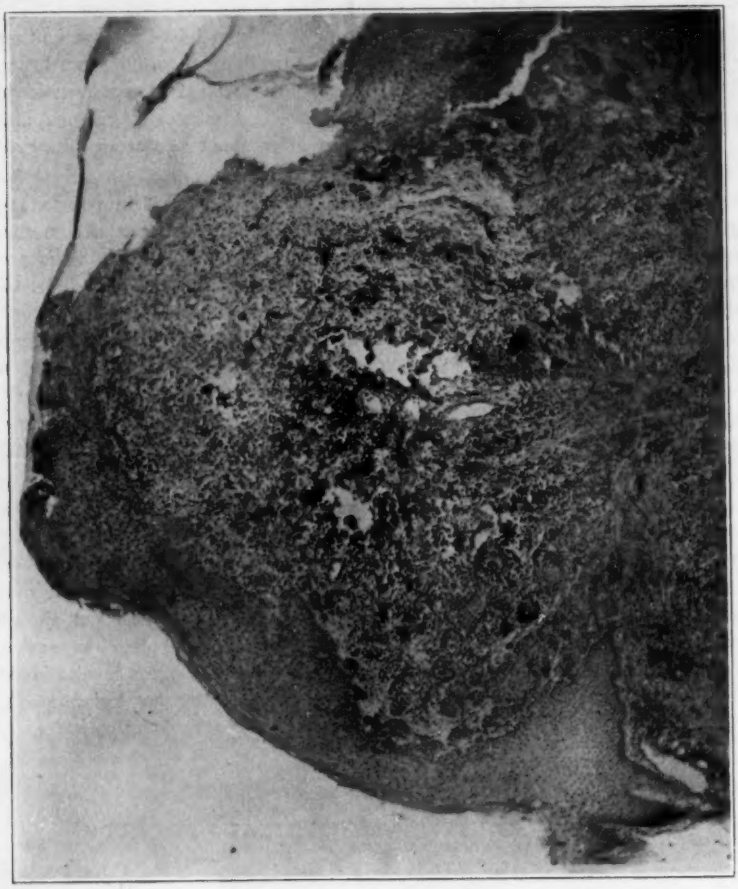

Fig. 1.—Section of growth from the limbus of P.L. Diagnosed as melanotic carcinoma; × 38.

to have been present for one month. The tumor was fixed, involved the conjunctiva and subconjunctival tissue, and was 5 mm. in diameter and 2 mm. thick. Vision was normal. After several ineffective treatments with radium, the growth was removed and found to be an epithelioma when studied histologically. A recurrence was apparent in less than a month; by December the mass measured 10 by 12 mm. A second surgical removal was followed by electrocauterization of the

whole area, with partial covering by a conjunctival flap. Six years later, no trace of the growth could be discovered in the eye, which had a visual acuity of 20/20 with glasses.

P. L., aged 39, was first seen in November, 1927. Twenty years previously he had removed from the left eye a piece of steel which had been there for ten years, and which apparently was imbedded in proliferated tissue at the temporal lumbus. A recurrent growth at this site was again removed in 1925. Two recurrent growths

Fig. 2.—Sections of growth from the neck of P.L. Diagnosed as melanotic carcinoma; × 75.

were removed, subsequently, and were found to be malignant. Roentgen treatment was given for a month, with slight improvement. The fourth and last removal of the tumor was done by Dr. Ellett in December, 1927, and the tissue was diagnosed melanotic carcinoma by Dr. Fleming. Six months later there was a recurrence at the site, and soon thereafter a swelling appeared in the left side of the neck; biopsy showed this to be a melanotic sarcoma.

DR. KEY: This type of carcinoma has been so destructive that it was rather anticipated that it would come into the orbital tissue, but it did not do so. Eventually it metastasized into the glands of the neck. He was therefore sent to the Skin and Cancer Hospital. The growth rapidly extended into the abdominal cavity and elsewhere, probably to the liver, and the patient died about a month and a half afterward.

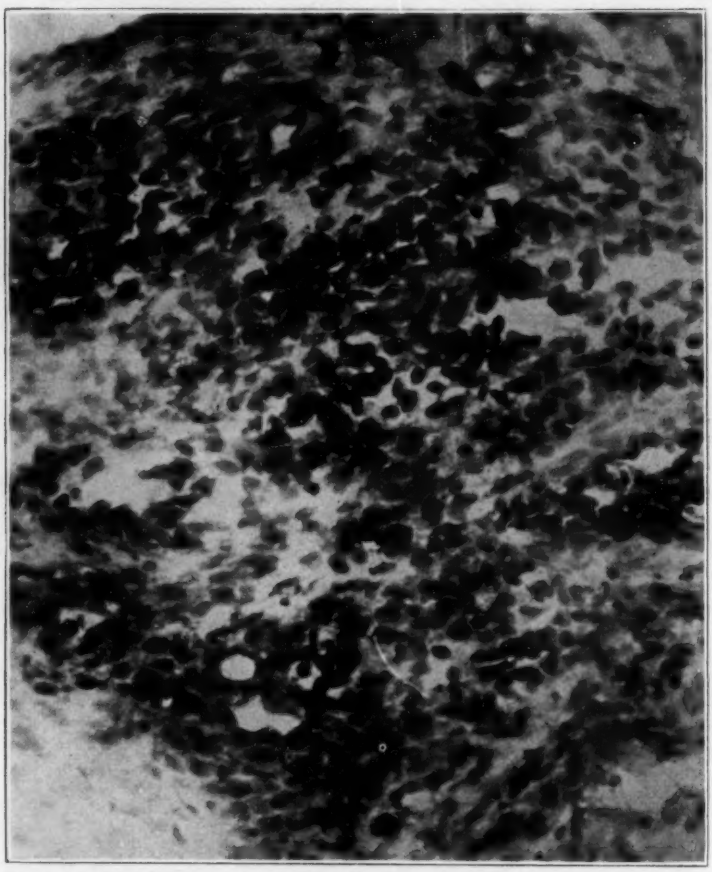

Fig. 3.—Sections of growth from the neck of P.L. Diagnosed as melanotic carcinoma; × 250.

COMPLETE EXENTERATION OF THE ORBIT FOR NEGLECTED EPITHELIOMA OF THE EYELIDS BY ELECTROCAUTERY. DR. EDWARD B. HECKEL, Pittsburgh.

This paper appears in full in this issue, p. 549.

DISCUSSION

DR. W. E. LAMBERT, New York: The removal of an epithelioma of the eyelids by another oculist in a case that I saw was followed by involvement of the globe,

which had to be removed. Subsequently, I exenterated the orbit, sent the patient home to England to die. About a year afterward, the patient sent me a photograph showing him looking as well as ever.

EXACTLY APPOSITIONAL SCLERAL SUTURES FOR CATARACT INCISIONS. DR. CLIFFORD B. WALKER, Los Angeles.

Many opthalmologists of large experience do not favor the use of sutures in the operation for cataract and their position is taken, for the most part, on strong ground. One of the hardest conditions to meet is that of precise apposition of the margins of the wound, not only along its axis, which may be distorted by side slip or pucker, but also at right angles to this plane.

To obtain as much control as possible over these conditions, a few special devices and a definite technical procedure were used which apparently assured exact apposition at the suture points, and corresponding improvement in the wound at all other points. More than one suture was used as a rule, and a tendency to check prolapse of the iris seemed to be much greater than when nonappositional sutures were used.

DISCUSSION

DR. F. H. VERHOEFF, Boston: I have nothing to say about sutures other than I have said a number of times before. It seems that Dr. Walker must have overlooked my latest paper on the subject. I have an idea that if he had seen the method there described he would not have worked out this one. I think it gives better apposition than his and the suture is not so much trouble to insert. I frequently use three sutures when I have a patient who has severe paroxysms of coughing or who is likely to vomit after the operation.

One thing Dr. Walker has suggested that will be of great value to me is the use of the Carrel needle. I have never used it, but have had to get along with needles that are considerably larger. I have done well with them, but I shall appreciate a more delicate needle.

DR. JONAS S. FRIEDENWALD, Baltimore: How long does Dr. Walker leave the suture in?

DR. WALTER B. LANCASTER, Boston: Has Dr. Walker any records as to the amount of astigmatism present after this method is used?

DR. WALKER: The longest time that I leave the suture in is twelve days. The suture will loosen itself and lie in the conjunctiva at that time. I like to remove the stitch as soon as convenient after the seventh day. I have no measurements as to the development of tensile strength as determined by Dr. Harvey in other tissues. That will be interesting to determine.

In regard to the amount of astigmatism, I have not found that it exceeds the ordinary limits. I think that the astigmatism is less with the actual apposition of the cornea than when the wound is allowed to come together as it pleases.

ETIOLOGY AND TREATMENT OF KERATOCONUS. DR. ARNOLD KNAPP, New York.

This paper will appear in full in a later issue of the ARCHIVES.

DISCUSSION

DR. F. H. VERHOEFF: I should like to ask Dr. Knapp whether the visual acuities noted were determined without glasses or were best determined with high cylinders?

DR. G. S. DERBY, Boston: I think the usefulness of the contact glass should not be forgotten in these cases. A woman, aged 45, with bilateral conical cornea,

had poor vision in her right eye after cauterization of the cornea, and the left eye with a 12 cylinder had a vision of 6/15 minus. The patient was a school teacher, and had a great deal of difficulty in continuing with her work. A 7 Zeiss contact glass over the left eye afforded a visual acuity of 6/9 minus, and an 8.1 glass over the right eye gave an acuity of 6/12 minus. The patient has been wearing contact glasses now for five months, and is able to keep them in for a large part of every day, and to continue with her work satisfactorily.

Dr. G. E. de Schweinitz, Philadelphia: Following the suggestion of Dr. Peter Schwenk, my associate Dr. B. F. Baer tried the effect of the thermophore (Shahan's instrument) in three cases of conical cornea.

A 2 mm. thermophore tip, at a temperature of 145 C. is held in contact with the opaque apex of the cone for forty-five seconds, after thoroughly anesthetizing the cornea with a 1 per cent solution of a brand of phenocaine. Subsequently, three or four instillations of phenocaine are used at hourly intervals to allay pain. The thermophore is reapplied after an interval of five or six weeks. There has been no increase in corneal opacification as a result of this treatment.

In one case the vision improved from 6/100 to 6/22, and the refraction changed from + 4 sph. = — 12 cylinder axis 105, to + 2 sph. = — 8 cylinder axis 100. The other patients were clinic patients, difficult to follow along, so that the visual improvement cannot be reported.

Dr. M. Hayward Post, St. Louis: I was interested in the remarks of Dr. de Schweinitz concerning the use of the thermophore in conical cornea. Though I have never used it for this condition, I can state that no opacity has ever been produced in normal corneal tissue by the use of the thermophore at 145 C. in the experience of any one in my office, despite the fact that a large number of patients have been treated with it.

Dr. John W. Burke, Washington, D. C.: How much lowering of vision has Dr. Knapp found after using his operation?

Dr. William L. Benedict, Rochester, Minn.: Does Dr. Knapp do an iridectomy before cauterization and puncture of the cornea or afterwards, and about what is the time that should elapse between the two steps?

Dr. E. V. L. Brown, Chicago: I should like to know the average interval after which he obtained the vision stated.

Dr. William H. Wilder, Chicago: Years ago, Axenfeld called attention to the pulsation of the mire images over the apex of the cone, synchronous with the arterial pulse, when the eye is viewed with the ophthalmometer. It seems to me that there is grave risk, when the cornea is extremely thin, of letting the cautery come in contact with the anterior surface of the lens when puncturing the apex.

In several cases I have practiced a method of cauterization which has given, for a time at least, considerable improvement in vision. The purpose of the cauterization is to preserve the clear apex of the cone, but to flatten it by properly placed scar tissue. This is done by cauterizing a small triangular area at 12, 3, 6 and 9 o'clock, in each case with the base toward the limbus but not up to it, and the apex toward the center of the cornea, but not reaching to it. I have found that the after results of this method are good.

Dr. F. H. Verhoeff: In a case of conical cornea, following rupture of Descemet's membrane with mushy, gelatinous stroma, I excised a crater-like area at the apex of the cone, and sewed it up. After the cornea cleared, and after an iridectomy was done, the patient had 20/100 acuity with this eye.

Many of my patients with conical cornea have been nervous and hysterical. When this patient came back for iridectomy, I found two-thirds of the cornea

abraded. Later, the patient admitted that she had scratched the cornea because she did not want the operation performed although she had agreed to it.

DR. W. E. LAMBERT: I remember two cases of conical cornea in which an operation was performed by cauterization with satisfactory results.

DR. WILDER: The purpose of cauterization in these positions is to obviate the possibility of scar at the place where one would like to perform iridectomy later, if that should become necessary. If another operation must be resorted to, there is still a valuable clear portion of the cornea downward and outward, or downward and inward, where one can make an iridectomy.

DR. BERNARD SAMUELS, New York: What is Dr. Knapp's procedure in cases of conical cornea in which there is an active keratitis such as occurs when there is a rupture of Descemet's membrane? Last summer Professor Fuchs called attention to the reduced vitality, and the inflammation set up in the corneal tissues after rupture of Descemet's membrane. I recently had a case of conical cornea with an exceedingly marked keratitis. This cleared up promptly after an iridectomy, and it seems to me that it would have healed up just as promptly if I had only made an incision with a keratome.

DR. JONAS FRIEDENWALD: I was surprised that no one mentioned the use of the trephine operation. It seems to me that while the cauterization procedure may improve the optical qualities of the eye, it is not a method that will prevent the progress of disease. I should like to ask Dr. Knapp whether thinning of the cornea tends to progress after cauterization.

In two cases under my observation the condition was brought to a standstill through trephining, and it seems to me that trephine operations might be employed before using the cautery to improve the optical characteristics.

DR. KNAPP: In answer to Dr. Verhoeff, the primary vision was generally uncorrected. In only one or two cases could it be improved to a negligible degree. The final results were given with corrected glasses.

As to the contact glass, my own experience is extremely limited. I quite agree with Dr. Derby that it is a simple method and should be tried.

Dr. de Schweinitz' suggestion in regard to the thermophore was interesting; I think that it might be tried out in the mild cases, though I fear that the results would not be lasting. It seemed to me that in the cases of keratoconus in which perforation had not taken place at the time of operation the process was not checked.

The association of keratoconus and cataract is an interesting observation which I have not made.

Dr. Burke asked how low the sight should be before the operation should be attempted. It seems to me that vision of fingers at less than 10 feet (3 meters) justifies an operation of this kind. Cases in which the operation resulted in a little better vision were generally those of the second eye, the patient being pleased with the result in the first eye.

Whether the iridectomy should be done before or after, answering Dr. Benedict, Dr. Weeks precedes cauterization by an iridectomy. This undoubtedly has an advantage in counteracting tension after cauterization. At the same time I think that it is difficult to decide beforehand what part of the cornea is the most favorable site for the iridectomy.

In answer to Dr. Brown, the vision which I mentioned in the last paragraph was the last vision recorded.

The pulsation of the apex to which Dr. Wilder referred is an interesting phenomenon. At the same time I think that perhaps Axenfeld's chief contribu-

tion has been the discovery of anesthesia at the apex of the cornea. It has led to some interesting work on whether the whole process was not a dystrophic disturbance. It has been decided that the anesthesia is a secondary condition and is directly proportional to the amount of opacity. It is well known that in conical cornea the slit-lamp has revealed an unusual number of corneal nerves.

The cauterization that Dr. Wilder suggested is interesting, although I think it only applies to cases in which there is no thinning of the cornea. In the cases that I reported, all the patients had thinning of the cornea. I have tried all kinds of cauterization around the apex, the horse-shoe shape especially, but have finally come back to cauterization of the apex.

The nervous symptoms of which Dr. Verhoeff spoke I think are rather common. In most of these cases the keratoconus has been associated with nervous instability. A physician who practices in Colombia, South America, told me that keratoconus is prevalent in that part of the world.

Dr. Samuels raises an interesting question as to the cases with rupture of Descemet's membrane. This produces a condition known as acute keratoconus, which is entirely different from the condition that I have described. In keratoconus that results from keratitis I think that not the cautery but the LaGrange operation should be used.

As to the trephine operation, I have not had any experience because I object to doing a trephine. The tension is usually subnormal in keratoconus and one is giving the patient the additional risk of a thin bleb. It does not seem to me to get at the corneal condition, which I think one can arrive at correctly only by replacing the thin cornea by a definite scar.

DENDRITIC KERATITIS FOLLOWING THERAPEUTIC INOCULATION OF MALARIA.
DR. WILLIAM C. FINNOFF, Denver.

The patient was treated for neurosyphilis with the plasmodium of tertian malaria. After the fourth chill, herpetic vesicles appeared on the left side of the nose and dendritic keratitis occurred in the left eye. The frequency of this complication in malaria is not generally known by neurologists who are employing malaria as a therapeutic measure. The importance of bringing this to their attention was emphasized.

DISCUSSION

DR. F. H. VERHOEFF: I have seen a number of cases of herpetic keratitis following injections of arsphenamine. Arsenic is known to cause herpes not infrequently.

In cases of dendritic keratitis, one can frequently obtain a previous history of malaria. An attack of malaria probably predisposes the patient to herpes, so that in later life he is more likely to have recurrent herpes from other causes.

DR. M. HAYWARD POST: Since 1922 the literature has been full of references to dendritic keratitis. Numerous workers have demonstrated that the lesion is transmissable from herpes labialis to cornea, from cornea to cornea, and from cornea to gasserian ganglion and vice versa. On the whole, opinion has rather worked away from the idea of the malarial agent, to give the lesions resemblance to those of epidemic encephalitis, with a filtrable virus of undetermined origin as the etiologic agent. Attention was called to improvement in dendritic keratitis following treatment with ultraviolet light, as worked out by Duke-Elder, Sanford Gifford and me.

DR. J. W. CHARLES, St. Louis: I am still convinced that the majority of cases of malarial keratitis exhibit an infiltrative or papular lesion instead of the vesicular lesion of true herpes.

DR. FINNOFF: The attention of all neurologists who are employing malaria as a therapeutic measure should be brought to the possibility of herpetic keratitis following malarial inoculations.

ALLERGIC PHENOMENA IN THE COURSE OF TUBERCULOSIS KERATITIS. DR. CHARLES W. TOOKER, St. Louis.

This paper appears in full in this issue, p. 540.

DISCUSSION

DR. W. GORDON M. BYERS, Montreal, Canada: Can you tell us a little more fully about the method of administration of tuberculin in these cases?

DR. WILLIAM C. FINNOFF: I have observed a great many times what was thought to be an allergic manifestation from tuberculin. Persons with active pulmonary tuberculosis frequently have inflammation of the eye without the formation of definite tubercles in the cornea or the uveal tract, and they have not shown a reaction to food or a reaction to other proteins when tested.

Tuberculous eyes will react to general treatment with sunlight, the eye growing worse after exposure to such a degree that light therapy has to be discontinued.

DR. F. H. VERHOEFF: I obtained focal reactions in tuberculous eyes several years ago following the injection of Coley's toxin. Hence, the tuberculous eye may react to a variety of causes, among which are fatigue and menstrual disturbances.

DR. JONAS FRIEDENWALD: Dr. Arnold Rich published in the *Johns Hopkins Hospital Bulletin* for May, 1929, some work which shows that allergy and immunity are entirely independent in tuberculosis. This belief is quite contrary to general opinion. Dr. Rich has shown that the healing or immune reaction is independent of the allergy, which gives rise to destruction of tissue. It seems rational, therefore, that the aim in using tuberculin should not be to produce a focal reaction in the eye, but rather to depress the allergy in the body, and thus to give the immune reaction a chance to work.

DR. E. V. L. BROWN: In a healthy, middle-aged woman, without fever or physical signs, a roentgen diagnosis was made of submiliary tuberculosis of the lungs. Into the margin of the cornea extended finger opacities situated in the mid-stroma, with central small isolated disks having clearer centers. The anterior stroma was permeated with fine vessels; these did not branch like vessels do in syphilitic interstitial keratitis. I have seen these little disks many time before, but I have never associated them with tuberculosis.

DR. TOOKER: The tuberculin was administered by Dr. Eyermann, and I advised him to stop short of focal reaction. I did not instruct him as to the intervals because he had had a large experience with tuberculin.

Answering Dr. Finnoff regarding the possibility that the allergic reactions were due to the protein content of the tuberculin used, this reaction did occur, but the allergic reaction to certain foods occurred also during the period when the patients were not receiving injections of tuberculin, these reactions were different from those following the administration of tuberculin.

PERIPHERAL PIGMENTATION OF THE CORNEA ASSOCIATED WITH LENTICULAR DEGENERATION OF THE PSEUDO-SCLEROSIS TYPE. DR. T. B. HOLLOWAY and DR. P. DELONG (by invitation), Philadelphia.

In a woman, a Russian, aged 35, the first neurologic symptoms were noted at 19 years of age. The time of onset, the character of the tremor, the absence of certain signs pertinent to multiple sclerosis, the mental deterioration and the presence of a typical brownish-green peripheral pigmentation of the cornea, the so-called Kayser-Fleischer ring, determined the diagnosis of a lenticular degenera-

tion of the pseudosclerotic type. A case with a similar history was recorded by one of us in 1914.

DISCUSSION

DR. WILLIAM B. DOHERTY, New York: A similar case was observed at Bellevue Hospital. The peripheral pigmentation could be seen with oblique illumination completely to surround the cornea, and was symmetrical in each eye. With slit-lamp there was reasonable assurance that the pigment was located in Descemet's membrane.

DR. E. V. L. BROWN: The symmetrical appearance of the arcs that Dr. Holloway described above and below should be thought of in connection with the fact that the sclera comes down farther and goes up farther from below than it does on the sides, and that Descemet's membrane is completely circular on the back of the cornea.

DR. HOLLOWAY: Answering Dr. Brown, in practically all of these patients the pigmentation has been entirely annular. We reported one case in which a double ring occurred. Two or three have been incomplete, but as yet little is known about the exact characteristics of pigmentation, and absolutely nothing is known as to how it gets into Descemet's membrane.

A CASE OF NODULAR SCLERITIS; THE PATHOLOGY AND ETIOLOGY. DR. DUNBAR ROY, Atlanta, Ga.

The pathology of scleritis and episcleritis is still veiled in obscurity. Holmes Spicer was probably right when he held that these forms of inflammation differ only in extent of involvement. Nodular scleritis is the severest form.

A woman, white, aged 50, was treated for three months for severe nodular scleritis of right eye on the nasal side. Every test, including the Wassermann and tuberculin tests, was made to obtain the pathogenesis. The condition was finally relieved by the daily application of water leeches.

The tuberculous origin of many of these obscure lesions of the eye is by no means definite.

DISCUSSION

DR. CARL KOLLER, New York: Bloodletting by superficial scarification or incision of the eyelids or the eyeball has been successfully used in various diseases of the eye. In most cases this procedure will cut short an attack of scleritis. It is also useful in chronic conjunctivitis, trachoma with pannus and relapsing abrasion of the cornea.

DR. JOHN W. BURKE: I had a case of diffuse scleritis in a young woman, aged 23, who developed acute miliary tuberculosis in three weeks and died in six months after one injection of tuberculin, which did not even give a focal reaction.

DR. ROY: I feel that some of my colleagues have been too enthusiastic in establishing tuberculosis as the cause of certain ocular inflammations. Finnoff said that biopsy, or injection of tissue into guinea-pigs is often necessary for a positive diagnosis.

THE RELATIONSHIP OF THE FLAVO-BACTERIUM OPHTHALMIAE TO PERIODIC OPHTHALMIA IN HORSES. DR. ALAN C. WOODS and EARL L. BURKY, M.D., Baltimore.

This paper appeared in full in the October issue, p. 456.

DISCUSSION

DR. G. E. DE SCHWEINITZ: I am informed by the authorities of the Hospital of the School of Veterinary Medicine of the University of Pennsylvania that two horses, subject to periodic ophthalmia, have been treated according to Dr.

Rosenow's method; also that there are a number of similar efforts being made along this line in one of the veterinary hospitals in the west.

In all these instances the serum produced no beneficial result, and those in charge of the affected horses were obliged to adopt other therapeutic measures. Perhaps Dr. Woods, in closing the discussion, will be kind enough to describe Dr. Rosenow's technic.

DR. F. H. VERHOEFF: After reading Dr. Rosenow's paper carefully, I expressed the opinion in my discussion of it that the burden of proof of his contention rested on one horse, and that this was too great a burden for one animal to bear. The excellent work that has just been described seems to prove that the burden really was too great for one horse.

DR. WOODS: It might be interesting to the society to know the method of treatment that Dr. Rosenow has been using. He used a filtrate that is supposed to contain the toxin, and made intracutaneous and subcutaneous injections. His filtrate was tried on several horses with entirely negative results. It apparently had no influence on the disease.

### NORMAL VISION, NINE YEARS AFTER THE PASSAGE OF A STEEL CHIP THROUGH THE CRYSTALLINE LENS. DR. WILLIAM F. HOLZER, Worcester, Mass.

F. T., aged 33, a machine operator, was seen on April 17, 1920. Six weeks previously, while he was grinding, a steel chip struck his left eye. Examination disclosed a corneal cicatrix, an injury to the iris and opacities in the anterior and posterior capsules of the lens, connected by a band of cataractous lens. The vision was 15/20 and Jaeger no. 1. Roentgen localization disclosed a foreign body in the lower part of the globe. The foreign body was extracted through a scleral incision with a hand magnet. Four days after the operation the vision with correction was 15/15—3, and ten days later 15/15 with the same correction. On June 12, 1920, he complained of supra-orbital and ocular pain, which was relieved by glasses. He was seen on Dec. 30, 1920, when a cast iron stain was removed from the left eye. At that time the vision was 15/15+2 and Jaeger no. 1.

On Feb. 9, 1929, no further gross changes could be observed. Slit-lamp study (not available in 1920) disclosed faint stellate striations in the subcapsular layers of the cortex. The visual field was normal, except for a scotoma corresponding to the opacity of the lens. The refraction had changed from compound hypermetropia of low degree to mixed astigmatism of low degree, the correction of which gave him 20/20+2 and Jaeger no. 1.

A review of the literature showed little reference to specific cases in which vision had been retained.

#### DISCUSSION

This paper was discussed by Drs. E. C. Ellett, Memphis, Tenn., Albert E. Bulson, Fort Wayne, Ind., Oscar Dodd, Evanston, Ill., and D. F. Harbridge, Phoenix, Ariz., all of whom presented cases of a somewhat similar nature.

### FLOATING CYST OF THE VITREOUS. DR. HUNTER SCARLETT, Philadelphia.

While making a routine ophthalmoscopic examination, preparatory to refraction, in an Italian girl, aged 8 years, I observed a translucent cyst about one and one-half times the size of the disk.

It was wider in its lower portion where it seemed to be capped by an irregular, round piece of tissue. The upper end presented a small headlike projection. There were numerous fine dots of pigment distributed over the surface, and at the junction of the middle and lower thirds there was a slight constriction, as if the cyst were bound by a band.

The cyst was freely movable in all directions whenever the eye moved, but always came back to its primary position when the eye looked straight ahead. It did not show spontaneous movement, nor could the possibility of a cysticercus be determined. The vision was diminished at times, and again became normal, depending entirely on the position of the cyst.

A diagnosis of uveal cyst was made from the presence of pigment on its wall, and the absence of other conditions such as hyaloid remains and cysticercus, which was primarily suspected.

DISCUSSION

Dr. Emory Hill, Richmond, Va.: Owing to the rarity of the conditions described by Dr. Scarlett, I record a similar case in a patient who has been under my care for eighteen months and who was previously under the care of Dr. W. E. Bruner of Cleveland for two and a half years.

A man in middle life complained of poor vision which varied from 5/60 to 5/30+ in the right eye, and from 5/40 to 5/20 in the left eye. The nerve heads were described by Dr. Bruner as slightly pale, especially in the lower temporal quadrants, in 1925. They were decidedly atrophic in 1928. There were fine vitreous floaters in each eye, and slightly contracted retinal arteries. In the right eye there was a cyst floating in the vitreous without any apparent attachment, and moving slowly with the movements of the eye. It reached to the anterior portion of the vitreous and appeared to be about two thirds of a disk diameter in size, and perfectly globular.

My observation and that of Dr. Bruner would indicate that no change has taken place in the three and a half years since the patient was first seen. The visual fields were slightly contracted in all meridians. The blind spots were much enlarged, reaching almost to fixation, and there were relative central scotomas for white and colors.

It is not necessary to go into detail as to the neurologic aspect or the treatment of this patient, as this has no bearing on the present discussion. The case is mentioned merely as an additional example of the rare condition described by Dr. Scarlett.

Crystalline Deposits in the Vitreous; Two Cases of Calcium Soaps Studied Microscopically and Histochemically. Dr. C. A. Clapp, Baltimore.

This paper will appear in full in a later issue of the Archives.

Microchemical and Histologic Observations in Asteroid Hyalitis. Dr. T. B. Holloway and Dr. W. E. Fry (by invitation), Philadelphia.

This paper appears in full in this issue, p. 521.

DISCUSSION

Dr. T. B. Holloway: In 1921, I called attention to the differential diagnosis between cholesterin crystals and asteroid hyalitis. In 1921 and 1922 I pointed out that synchysis scintillans was an unusual ocular manifestation and that I had seen only four cases of it. The diagnosis is easily made.

Dr. F. H. Verhoeff: The differential diagnosis between the two conditions is simple. The asteroid bodies in the vitreous are really stones. They do not, however, produce a foreign body reaction as do cholesterin crystals, lipoids and various degenerative products in the tissues. When cholesterin crystals occur in subretinal fluid, foreign body cells form around it. In the vitreous nothing of the kind is visible. One eye may show asteriod hyalitis, while in the other there will not be a trace for years. Asteroid hyalitis and synchysis scintillans are never seen in the same vitreous.

DR. CLAPP: I agree that it is comparatively easy to differentiate the two conditions. It was interesting to note that in Bachstez' second paper, all four patients died of malignant disease, in two cases of the gallbladder and in two of the liver. I do not believe anything has been discovered which gives much light on the etiology. As Dr. Verhoeff says, one eye will have pronounced stones in the vitreous and the other eye will be normal. I was unable to find ophthalmoscopically any other difference between the two eyes than these opacities.

DR. FRY: This was a unilateral case. The other eye, although examined, did not show any of these opacities.

HOMOLOGOUS NEUROBLASTOMA OF THE RETINA IN IDENTICAL TWINS. DR. WILLIAM L. BENEDICT, Rochester, Minn.

This paper appears in full in this issue, p. 545.

A RETINOBLASTOMA (SO-CALLED GLIOMA RETINAE) IN A MAN AGED FORTY-EIGHT YEARS. DR. F. H. VERHOEFF, Boston.

This paper will appear in full in a later issue of the ARCHIVES.

DISCUSSION

DR. WARREN S. REESE, Philadelphia: Dr. Reese reported an instance in which brain tumor occurred in each of a pair of twins.

DR. ADOLPH O. PFINGST, Louisville: The location of Dr. Verhoeff's tumor was contrary to the rule, as it emanated from or near the ora serrata and not from the posterior quadrants of the eye where four out of five gliomas take their origin.

DR. JONAS S. FRIEDENWALD: I should like to add a small bit of evidence in support of Dr. Verhoeff's conclusion that this was the eye of a patient in middle life. I have had the unusual opportunity of examining about three hundred specimens of children's eyes, and in none of these have I ever seen corpora amylacea of the optic nerve, which is in accord with Dr. Verhoeff's observations. The invasion of the choroid in this case seems rather remarkable and warrants the assumption that the tumor arose either in the ciliary epithelium or close to the ciliary body, or as an alternative suggestion, that the tumor may have arisen in the retina near an old chorioretinal scar. Without such a lesion it seems difficult to believe that the tumor would so early penetrate Descemet's membrane.

These papers were also discussed by Dr. Maxwell H. Langdon, Philadelphia, and Dr. E. V. L. Brown.

TERMINAL CHANGES IN A CASE OF RETINITIS WITH MASSIVE EXUDATION. DR. HARRY FRIEDENWALD and DR. JONAS FRIEDENWALD, Baltimore.

This paper will appear in full in a later issue of the ARCHIVES.

DISCUSSION

DR. ALBERT C. SNELL, Rochester, N. Y.: In 1927, I reported some early observations in a case of angiomatosis retinae. Since then the patient has developed subretinal hemorrhage, acute glaucoma, complete detachment of the retina and a quiet soft eye following posterior scleral trephining, which was performed in order to avoid the necessity of enucleation.

DR. WILLIAM L. BENEDICT, Rochester, Minn.: In 1926, I reported a case which closely resembled that of Dr. Friedenwald. This patient is now able to obtain 6/7 vision with telescopic spectacles. She showed marked atrophy of the vessels and pigment migration which is increasing.

A Case of Lipemia Retinalis. Dr. C. E. G. Shannon and Dr. Henry K. Mohler (by invitation), Philadelphia.

In a case of lipemia retinalis the patient gave a history of diabetes of seven years' standing. In the summer of 1928, he discontinued the weighed diet; he limited the amount, but did not keep to the prescribed twenty-four hour diet of 75 Gm. carbohydrate, 70 Gm. protein and 125 Gm. fat. Three months later, he developed drowsiness, pruritis of the scalp and weakness. Lipemia was marked and the typical observations in lipemia retinalis were present. Following injections of insulin, the lipemia retinalis disappeared within a few days.

DISCUSSION

Dr. William F. Hardy, St. Louis: Lipemia retinalis is of interest mostly as a medical curiosity. It possesses little practical concern except that it indicates advanced and severe diabetes; furthermore, it has been looked on as a forerunner of coma. Lipemia retinalis and hypotony have been associated in a number of cases of diabetes, but since the advent of insulin both symptoms have been rendered less probable, and with the widespread use of this preparation it looks as though these two symptoms will pass from observation as clinical entities.

Dr. Shannon: Regarding Dr. Hardy's statement as to the number of cases reported, my investigation revealed only thirty-six cases.

I agree with Dr. Hardy entirely that there will be fewer of these cases in the future since the advent of insulin.

The case is especially interesting because of the rapidity with which the retinal vessels cleared up following the employment of insulin. A number of observers question the effect of insulin in this condition, especially in view of the fact that in a certain number of cases in which insulin was not employed, the lipemia retinalis apparently cleared up as rapidly as those in which it had been used. In the case that I have described at least, the effect was so immediate following the injection of insulin, that I feel it must have played an important part in the rapid clearing up of the vessels.

A New Adaptometer and Its Use. Dr. George S. Derby, Dr. Paul A. Chandler (by invitation) and Louise Sloan, Ph.D. (by invitation), Boston.

This article will appear in full in a later issue of the Archives.

Ocular Lesions in Fetal Syphilis. Dr. Jonas S. Friedenwald, Baltimore.

Of thirty syphilitic infants, either stillborn or dying within the first three months after birth, nine showed ocular lesions attributable to the syphilitic infection, according to records in the Departments of Ophthalmology and Pathology of the Johns Hopkins Medical School. A control series of 145 nonsyphilitic infants showed no similar lesions. The observations consisted of a diffuse and focal infiltration of the uveal tract, sometimes with mononuclear wandering cells, but in other cases with myeloid cells. Later stages showed a diffuse fibrosis of the choroid. In two cases an intense retinitis and neuritis was found. Spirochetes could be demonstrated in some cases, especially in the sheaths of the penetrating vessels. The relation of these lesions to other lesions in fetal syphilis, and to the classic ophthalmoscopic pictures of congenital syphilis was discussed.

DISCUSSION

Dr. Friedenwald: One lesion shown was far anterior, near the ciliary body, but the character of the lesion was the same whether it was anterior or posterior. In most cases the choroidal lesion was diffuse and widespread, and tapered off at the edges.

The choroidal lesions occurred in my series in the four infants that were stillborn, in one that was slightly older, in one that was 2½ and one 6 months of age. Ito described a case in a child, aged 2½, which, except for the presence of the choroidal lesion, was almost identical with the most severe case described in this series. I do not believe that there is any precise age limit, but I think that the lesion occurs more frequently in intra-uterine life than was previously believed.

Spirochetes were not searched for in all of these cases, because tissues that are stained with silver are not useful for histologic study. In a number of syphilitic infants not included in this series, the infants were so macerated at birth that they were not of any use for histologic study, but they were studied for spirochetes. It is rather difficult to find spirochetes in these cases and I am skeptical about the reports in the literature of great numbers of spirochetes throughout the eyeball. In two cases spirochetes were found in the perivascular sheath of the penetrating vessels of the sclera, and in the last case reported one eye was stained for spirochetes while the other underwent the regular technic. In the eye that was stained for spirochetes one recognized that the lesion had the same general characteristics as those found in the other eye. Spirochetes were present in this case in the iris stroma.

This paper was discussed by Dr. George S. Derby, Dr. F. H. Verhoeff and Dr. Eugene M. Blake, New Haven, Conn.

BILATERAL COLOBOMA OF THE OPTIC NERVE, WITH HOLES IN THE DISK AND A CYST OF THE OPTIC SHEATH. DR. F. PHINIZY CALHOUN, Atlanta, Ga.

From an ophthalmoscopic examination of what is commonly termed coloboma of the nerve, it is difficult to tell whether the developmental defect is in the optic nerve or in the adjacent choroid.

In a patient, aged 10 months, the right globe was greatly displaced because of an orbital growth. There was a coloboma of each optic disk with a large hole or cavern in the right one. The arrangement of the vessels on the disks corresponded to Caspar's third classification. A cyst of the optic sheath, a meningocele and a tumor of the nerve, were considered as possible causes for the proptosis; the first being the most likely on account of the defects in the optic disk.

The globe with an attached cyst was removed. The histologic structures and defects were described. A differentiation between similar developmental defects in the choroid and the nerve was attempted. There were general comments on the defective closure of the edges of the embryologic optic cleft and its relation to the formation of the picture described as coloboma of the optic nerve.

DISCUSSION

This paper was discussed by Dr. Albert C. Snell and Dr. T. B. Holloway.

THE RELATION OF INTRA-CRANIAL ANEURYSMS TO PALSIES OF THE OCULAR MUSCLES. DR. ADOLPH O. PFINGST and DR. GLEN SPURLING (by invitation), Louisville, Ky.

This article was published in full in the October issue, p. 391.

DISCUSSION

DR. E. TERRY SMITH, Hartford, Conn.: In a case of suspected pituitary neoplasm, an operation by Dr. Harvey Cushing disclosed an aneurysm bulging between the chiasm and optic nerves.

DR. MARK SCHOENBERG, New York: In a paper entitled, "Syndrome de la paroi externe du sinus caverneux: ophthalmoplégie unilatérale et marche rapide-

ment progressive," Foix reported two cases showing unilateral ophthalmoplegia, beginning with paralysis of the sixth, extending to the third, fourth, and accompanied by severe pain in the territory of the first branch of the fifth nerve. In the first case he found a sarcoma of the posterior lobe of the hypophysis; in the second case the syndrome was brought about by a tumor of the sphenoid growing upwards. In both cases there was pressure exerted on the lateral wall of the cavernous sinus, where the nerves involved in this syndrome are found.

Two years ago, I saw a woman who within a short time developed total ophthalmoplegia and complete blindness of the right eye, with severe pain on the right side of the head, then total ophthalmoplegia and complete blindness of the left eye. There was amenorrhea. Roentgen examination showed erosion of the posterior clinoids. The vision improved to 5/200 and she had lost the lower field. I made a tentative diagnosis of tumor of the hypophysis of the posterior lobe, impinging on the external walls of the cavernous sinus. The patient was referred to Dr. Harvey Cushing, who disagreed with the diagnosis. He regarded the condition as an aneurysm of the internal carotid. He called attention to the paper of Symonds on intercranial aneurysms in which the following diagnostic points were emphasized; unilateral ophthalmoplegia beginning with potosis, occipitofrontal pain and hypesthesia of the upper trigeminal skin fields: at times subhyaloid retinal hemorrhages; and blood in the cerebrospinal fluid.

Dr. T. B. Holloway: I recently observed a case of aneurysm of the anterior portion of the circle of Willis. In Fearnside's series a diagnosis of aneurysm was made almost invariably after leaks had occurred, but the diagnosis of aneurysm previous to the leakage was an exception. Many of these aneurysms are small and never give rise to symptoms. In the Fearnside series, the third nerve was most often involved and almost invariably the condition began with ptosis.

The diagnosis of intracranial aneurysms is easier as they tend to be associated with leaks or frank subarachnoid hemorrhage. The diagnosis of spontaneous subarachnoid hemorrhage, so frequently dependent on a ruptured aneurysm, is comparatively easy.

Dr. Clifford B. Walker, Los Angeles, Calif: I wish to emphasize the importance of calcification as noted in roentgenograms. It occurs in the blood vessels at the choroid plexus; it is found in tumors, especially meningiomas. Palsy of the sixth nerve can occur in the presence of an increase in cerebral pressure alone. Fields should be carefully studied.

Dr. Adolph O. Pfingst: Dr. Pfingist reported on the experiences of a number of surgeons regarding the frequency of cerebral aneurysms and their relation to the ocular paralysis. The growths are sufficiently common to be of importance not only to ophthalmologists but to neurologists as well.

A New Method of Mapping Out Paracentral Scotomas and Other Defects in the Visual Fields. Dr. Mark J. Schoenberg, New York.

This article will appear in full in a later issue of the Archives.

DISCUSSION

Dr. Clifford B. Walker, Los Angeles: Dr. Schoenberg has worked out a method that should be of considerable value. The use of the prism in this manner suggests Wilbrand's method of using the prism in hemianopia; that is, throwing the image on the blind retina, locating the fibers and bringing the eye toward the object without seeing. Then, if one adds to that the principle of Priestley Smith's scotometer, one would have about what was included in Dr. Schoenberg's proposition.

In the presence of good macular vision in both eyes, the question is whether better fixation can be obtained binocularly or monocularly. That is to say, with good macular vision the less the patient is required to do, the more attention he will give to field work. If the patient has a good sense of fixation and minute work is to be done around the macula the distance can be increased to 4,000 mm. and a letter test used that is within his visual acuity for the fixation point; as he reads the letter, one can observe the centric motion. Lack of fusion, of course, would always be a handicap. Another important point is that the size of the fixation point must be equal to the size of the test object. I like to use a different visual angle in detecting early scotoma; therefore, I like to use small test objects. That would be perfectly possible, although the test object which Dr. Schoenberg used in New York was rather large — about 5 mm.

One other effect takes place with the prism and that is the chromatic effect. If the deviation is half way to the blind spot, the part away from the center has a red, white and blue appearance.

I do not see how retinal fatigue would be reduced by this method. I think that probably one would require another person to watch the pupil to be sure it was being split.

Dr. Walter B. Lancaster, Boston: A great advantage of this method is that one can dispense with binocular vision and get good results in central scotoma by using only one eye. I doubt whether one would get as good results in partial defects.

Dr. F. H. Verhoeff: I can see but one advantage in the instrument, namely, that it gave the same angular displacement of the images for all distances of the object. I cannot see any place for this instrument.

Dr. Schoenberg: Dr. Schoenberg answered all the objections.

Divergence Excess: Frequency, Correlation with Refraction and the Value of Orthoptic Treatment. Dr. Conrad Berens, Dr. LeGrand Hardy (by invitation) and Elizabeth Stark, A.M. (by invitation), New York.

The authors review the varying opinions found in the literature in regard to the condition known as divergence excess. From a study of over 11,000 case records, they attempted to determine as accurately as possible the answers to several disputed questions: particularly those of its frequency and correlation with refraction and the value of orthoptic treatment.

The following conclusions are drawn: 1. Divergence excess occurs in the private practice of ophthalmology in New York City in from 1 to 2 per cent of cases. 2. It is not correlated with refraction. 3. Orthoptic treatment is frequently of great value and in some cases obviates the necessity for operation. It should be tried in every case primarily, and in the cases that ultimately require surgical treatment it should be continued as an adjuvant treatment to insure the best possible results.

DISCUSSION

Dr. Charles A. Young, Roanoke, Va.: Does routine prolonged ocular occlusion help either an esophoria or an exophoria?

Dr. Berens: In regard to Dr. Young's question, we did not use occlusion. Hyperphoria was found in many of these cases in moderate degree. We sometimes found that the hyperphoria became less and, furthermore, that it produced no symptoms. Therefore, we did not resort to the occlusion test.

# Book Reviews

SAGGI DI OFTALMOLOGIA. Rome, 1929.

This volume is a report of the scientific work done in the clinic at Rome conducted by Prof. Q. Di Marzio during 1928. It contains reports of clinical and laboratory investigations by members of the staff clinic, nearly all of which are of a type which would justify their publication in any ophthalmologic journal, but none of which, so far as the reviewer knows, have been published elsewhere. Seven of these are by Magnasco, four by Triossi, two each by Moscardi, Mamoli and Del Duca, with single contributions by Caramazza and Silvagni, Neuschüler, Scardapane, Cattaneo, Sabbadini and a summary of the work of the clinic by Di Marzio. Proper notice of all these contributions would be impossible within the space allotted to an ordinary book review, so only a few of special interest will be mentioned.

Magnasco gives his experience with ten cases of cornea leukoma in which staining was done with gold chloride. Work on animals had shown him how different grades of staining could be produced; 2 per cent gold solution reduced by epinephrine or 1 per cent tannic acid gave light gray, 4 per cent gold solution with the same reducing agent gave darker gray to brown, while 2 or 4 per cent gold solution reduced by 2 per cent hydrazine hydrate always gave an almost pure black. The weaker gold solutions need not be neutralized, while the 4 per cent solution must be neutralized with sodium carbonate till it is only faintly acid to avoid too caustic an effect on the cornea. In most of the cases, the cosmetic effect was good; much better, the author believes, than could have been obtained by the older methods, the exceptions being in three cases of very vascular scars or highly degenerated corneas, in which the stain faded considerably or disappeared entirely. Most of the cases were not followed sufficiently long to judge of the permanent result; some, however, were followed as long as four months.

In a case of black cataract, Magnasco examined the extracted lens carefully by histologic and biochemical methods. Tests for fat, blood pigments, lipochromes or tyrosine lipoids were all negative, and the author believe that the theory that the color is due to the oxidation of tyrosine normally present in the lens has not been confirmed. The amount of cholesterol in the lens was increased compared to that in other cataractous lenses, and the blood cholesterol of the patient was increased to 2.10 per thousand, as against a normal of 1.50 per thousand. The histologic examination showed the whole lens to be densely sclerotic, the fibers to the periphery showing a close adhesion to each other, with no fluid or débris between them such as is found in ordinary cataract. Magnasco considers the process to be essentially one of extreme sclerosis, the whole lens being converted into a nucleus, and hence it cannot be said that black cataract is a distinct type apart from other cataracts. The same author examined a number of cataractous lenses for their cholesterol content, and found that while ordinary senile cataracts contained 2.61 parts per thousand, sclerotic lenses with brown nuclei contained on an average of 5.58 parts per thousand. Cataracts in which the

characteristic clinical observation of cholesterol crystals in the lens was present, contained an even higher proportion, 6.86 parts per thousand. No relation was found between the cholesterol content of the lens and that in the blood, which speaks against the theory that hypercholesterinemia is responsible for the increased cholesterol in the lens, and in favor of local factors as a cause for this increase. In cases of brown and black cataract, a hypercholesterinemia was observed, but the author is not inclined to consider this the cause of the increased cholesterol in the lens, but rather that the two observations are due to a slowing of cellular metabolism. He investigated the blood cholesterol of patients with other conditions, and found it notably increased in subjects of xanthelasma and arcus senilis, while in cases of corneal degeneration of other types, no increase was noted. In one case of xanthelasma, with notable hypercholesterinemia, the cholesterol in the excised tissue itself amounted to 27.49 parts per thousand, a larger amount than is found even in the brain. The hypercholesterinemia would thus seem to be an important causative factor in both xanthelasma and arcus senilis. In cases of albuminuric retinitis, while hypercholesterinemia occurred, many normal values were also found, so that the significance of cholesterol in this condition is doubtful.

Moscardi gives his results with the use of injections of epinephrine in twenty cases of glaucoma, and with drops of an epinephrine substitute in nineteen cases. The former produced significant reductions of tension in many cases, especially in those of simple glaucoma, but these reductions were seldom of long duration. Drops of an epinephrine substitute reduced tension in all cases of simple glaucoma, without the uncomfortable symptoms sometimes observed after the use of epinephrine. Pilocarpine was more effective after the use of the epinephrine substitute. An acute attack of glaucoma was brought on in only one case, with a tension of 75, but after twenty-four hours, this was reduced to 15 mm., according to the Schiotz tonometer, and remained at 15 mm. during an observation of forty-five days. In some cases of absolute glaucoma, considerable reductions were observed, but in inflammatory glaucoma, results were negative. One case of buphthalmos showed a reduction from 75 to 55, which was maintained for sixty days. An epinephrine substitute was tried in five cases of acute glaucoma, with slight reduction of tension in only two. Repeated treatments with this drug proved less efficacious than first treatments. On the whole, drops of it were slightly more effective and in a slightly larger proportion of cases than injections of epinephrine.

Moscardi treated thirty patients with corneal ulcer with the uviol light, and reports his results. Treatments were given for from four to six minutes twice a day, rose bengal being used as a sensitizer. Twenty-three were cases of hypopyon ulcer, and in all but three of these, which were very advanced, good results were obtained. In herpetic and dendritic ulcers, and some other cases of nonsuppurative keratitis which had resisted other forms of treatment, prompt healing followed the light treatments.

Triossi followed up some previous work of Sabbadini on the use of the roentgen rays in trachoma. He reports eleven cases of various types in which biopsy of the conjunctiva was made after from three to eight months from the last treatment. Thirty-three per cent of a skin

erythema dose was given on the everted lids, and was repeated from three to five times. In all cases, the appearance of the lids and especially of the corneas affected by pannus, was much improved, a number being clinically cured. Histologically, a reformation and levelling of the irregular epithelium was observed, with production of new connective tissue, formation of many new vessels, and absorption of the follicles and infiltration. While this went on to almost complete disappearance of the infiltration in a few cases, in others which were clinically cured, foci of lymphoid infiltration could still be found, the "radio-resistant areas" described by Sabbadini. While methods and dosage have yet to be standardized, the author believes that roentgen treatment offers great possibilities in the treatment for trachoma.

Triossi reports fourteen cases of papilledema in nephritis. Edema of the nerve head and surrounding retina was practically the only ophthalmoscopic observation in these cases, resembling in appearance the picture seen in serous meningitis. The author attempted to determine by clinical and laboratory observations whether this picture is peculiar to some type of nephritis. Blood chemistry and blood pressure varied greatly, and the only constant observations were albuminuria, headache and generalized edema. Simple puncture revealed increased intracranial pressure in four of the eight cases tested. The author concludes that both cerebral edema producing increased intracranial pressure and edema of the nerve head itself as part of a generalized edema are factors in the condition.

SANFORD R. GIFFORD.

RECENT ADVANCES IN OPHTHALMOLOGY. By W. STEWART DUKE-ELDER. Second edition. Pp. 405, with four colored plates and 110 text figures. Philadelphia: P. Blakiston's Son & Company, 1929.

This work is given its deserved place by all students of ophthalmology as a supplement to the standard texts. The readers will welcome the author's service in gathering 370 additional references, and in increasing the volume of the text by about one-fourth, all accomplished in the short space of two years since the appearance of the first edition. There is no doubt that one of the best "advances" in recent years in the field of ophthalmology is this little book in its several editions. As never before, the busy ophthalmologist can follow the productive research work from the earth's four corners in a coherent and intelligent fashion in the time that he has for his reading.

The present edition goes a little further than its predecessor into the nature of light, and the transmission and absorption of light by the media of the eye. One notes with interest the peculiar types of injury, thermal and abiotic, produced in the cornea, iris, lens and retina by radiant energy, and one realizes more than ever that the retina is not as well protected as it might be from injury by radiant energy, particularly of the thermal type. One would like to know more about photochemistry, and the conversion of spectral light into the visual impulse in the retina. Perhaps subsequent editions will be able to amplify the understanding of this most important transformation of energy.

The origin and the physical and chemical nature of the vitreous have properly been given a prominent place by the author. More and more are the serious students of the glaucoma problem looking to the

vitreous for information. Ida Mann's opinion carries authority, that the adult vitreous is almost entirely derived from the neural ectoderm of the inner layer of the optic cup, the only exception being that portion of the vitreous derived from lens ectoderm possibly from mesoderm and lying immediately behind the lens and around the canal of Cloquet. The vitreous is coming to be regarded as a cell product, an amorphous gel, laid down during embryonic life and not regenerated when lost, comprising in the adult eye four fifths of the volume of the globe, and playing a large part in the physiologic and pathologic conditions of the globe. The author reports studies concerning the iso-electric point of the vitreous in health and in disease, and remarks that the matter is a complicated one involving more problems than have yet been considered.

Other sections of the book have been uniformly enriched in text and illustration, and the final section carries the recent advances in the neurology of vision, particularly those contributions to the understanding of the oculomotor tracts, and the interesting work of Pavlov and his associates on cerebral activities by the interpretation of them through physiology.

J. HERBERT WAITE.

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## CORRECTION

In the article "Glutathione in the Crystalline Lens," by Drs. I. S. Tassman and W. G. Kurr, which appeared in the October issue (**2**:431, 1929) the paragraph at the top of page 433, referring to the work of M. Goldschmidt, should read: M. Goldschmidt,[8] in 1924, called attention to the H-ion concentration of $p_H$ 7.5 and the presence of a definite amount of glutathione in the lens, as possible factors essential for maintaining its normal auto-oxidation balance and structure."

The footnote referred to in this sentence should read:

8. Goldschmidt, M.: Die Autoxydation der normalen und pathologischen Lense, Graefe's Archiv für Ophthalmologie, 1924, p. 113.

# Directory of Ophthalmologic and Otolaryngologic Societies *

## FOREIGN

### Oxford Ophthalmological Congress

Master: Dr. A. B. Cridland, Salisbury House, Chapel Ash, Wolverhampton, England.
Secretary: Dr. C. G. Russ-Wood, 12 St. John's Hill, Shrewsbury, England.

## NATIONAL

### American Medical Association, Section on Ophthalmology

Chairman: Dr. T. B. Holloway, 1819 Chestnut St., Philadelphia.
Secretary: Dr. William C. Finnoff, Imperial Bldg., Denver.
Place: Detroit. Time: June 23-27, 1930.

### American Academy of Ophthalmology and Oto-Laryngology

President: Dr. Harris P. Mosher, 828 Beacon St., Boston.
President-Elect: Dr. William H. Wilder, 122 S. Michigan Ave., Chicago.
Executive Secretary: Dr. William P. Wherry, Medical Arts Bldg., Omaha.
Place: Atlantic City, N. J. Time: Oct. 21-25, 1929.

### American Ophthalmological Society

President: Dr. W. Campbell Posey, Radnor, Pa.
Secretary: Dr. Emory Hill, 501 E. Franklin St., Richmond, Va.

## LOCAL

### Los Angeles County Medical Society, Section on Ophthalmology and Otolaryngology

President: Dr. Harold S. Muckleston, 6422 Hollywood Blvd., Los Angeles.
Secretary-Treasurer: Dr. J. Frank Friesen, 1208 Roosevelt Bldg., Los Angeles.
Place: California Lutheran Hospital, Assembly Room. Time: 8 p. m., first Monday of each month.

### Colorado Ophthalmological Society

President: A presiding officer is selected for each meeting alternately until all members have served.
Secretary: Dr. Donald H. O'Rourke, 217 Imperial Bldg., Denver.
Place: First floor, Metropolitan Building, Denver. Time: 7:30 p. m., third Saturday of the month, October to April, inclusive.

### Medical Society of the District of Columbia, Section of Ophthalmology and Oto-Laryngology

Chairman: Dr. Louis S. Greene, 1710 Rhode Island Ave. N. W., Washington.
Secretary: Dr. E. R. Gookin, Medical Science Bldg., Washington.
Place: 1718 M St. N. W. Time: 8 p. m., third Friday of each month.

### Atlanta Academy of Ophthalmology and Oto-Laryngology

President: Dr. H. F. McDuffie, 45 Edgewood Ave., Atlanta, Ga.
Secretary: Dr. Leon E. Brawner, 157 Forrest Ave. N. E., Atlanta, Ga.
Place: Academy of Medicine, 38 Prescott St. N. E. Time: 8 p. m., last Thursday of each month.

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* Secretaries of societies are requested to furnish the information necessary to make this list complete and to keep it up to date.

### Eye, Ear, Nose and Throat Club of Georgia

President: Dr. George B. Smith, Rome.
Secretary-Treasurer: Dr. William O. Martin, Jr., 384 Peachtree St., Atlanta, Ga.

### The Chicago Ophthalmological Society

President: Dr. Charles G. Darling, 30 N. Michigan Ave., Chicago.
Secretary: Dr. Richard C. Gamble, 30 N. Michigan Ave., Chicago.
Place: Medical and Dental Arts Club. Time: Third Monday from October to May.

### Indiana Academy of Ophthalmology and Oto-Laryngology

President: Dr. Albert E. Bulson, 406 W. Berry St., Fort Wayne, Ind.
Secretary: Dr. Robert J. Masters, 601 Hume-Mansur Bldg., Indianapolis.
Place: French Lick Springs Hotel. Time: December 12 and 13, 1929.

### Indianapolis Ophthalmological and Oto-Laryngological Society

President: Dr. Robert J. Masters, Hume-Mansur Bldg., Indianapolis.
Secretary: Dr. Kenneth L. Craft, Hume-Mansur Bldg., Indianapolis.
Place: University Club. Time: 6:30 p. m., second Thursday of each month from October to May.

### New Orleans Ophthalmological and Otological Society

President: Dr. M. Earle Brown, Maison Blanche, New Orleans.
Secretary-Treasurer: Dr. W. A. Wagner, Pere Marquette Bldg., New Orleans.
Place: Eye, Ear, Nose and Throat Hospital. Time: 8 p. m., third Thursday of each month from September to June.

### Baltimore Medical Society, Section on Ophthalmology

Chairman: Dr. Leo J. Goldbach, 1012 N. Charles St., Baltimore.
Secretary: Dr. Angus Lloyd MacLean, Johns Hopkins Hospital, Baltimore.
Place: Medical and Chirurgical Faculty, 1211 Cathedral St. Time: 8:30 p. m., fourth Thursday of each month from October to May.

### New England Ophthalmological Society

President: Dr. W. Holbrook Lowell, 82 Commonwealth Ave., Boston.
Secretary-Treasurer: Dr. E. B. Dunphy, 520 Commonwealth Ave., Boston.
Place: Massachusetts Eye and Ear Infirmary, 243 Charles St., Boston. Time: 8 p. m., third Tuesday of each month from November to April, inclusive.

### Detroit Ophthalmological Club

Chairman: Members rotate alphabetically.
Secretary: Parker Heath, David Whitney Bldg., Detroit.
Time: 6:30 p. m., first Wednesday of each month.

### The Minnesota Academy of Ophthalmology and Oto-Laryngology

President: Dr. C. N. Spratt, 900 Nicollet Ave., Minneapolis.
Secretary-Treasurer: Dr. J. H. Morse, 80 S. 7th St., Minneapolis.

### Kansas City Society of Ophthalmology and Otolaryngology

President: Dr. L. R. Forgrave, Logan Bldg., St. Joseph, Mo.
Secretary: Dr. A. E. Eubank, Argyle Bldg., Kansas City, Mo.
Time: Third Thursday of each month from September to May. The November, January and March meetings are devoted to clinical work.

### St. Louis Ophthalmic Society

President: Dr. William H. Luedde, Metropolitan Bldg., St. Louis.
Secretary: Dr. Leo L. Mayer, Carleton Bldg., St. Louis.
Place: St. Louis or Washington University Cafeteria.
Time: 6:30 p. m., fourth Friday of each month from October to April, inclusive.

### Omaha and Council Bluffs Ophthalmological and Otolaryngological Society

President: Dr. Charles M. Swab, Medical Arts Bldg., Omaha.
Secretary-Treasurer: Dr. J. C. Davis, 1615 Howard St., Omaha.
Place: Medical Tea Room. Time: 5:15 and 7:00 p. m., third Wednesday of each month from October to May.

### Academy of Medicine of Northern New Jersey, Section on Eye, Ear, Nose and Throat

Chairman: Dr. Frederick J. Wort, 1080 Broad St., Newark.
Secretary: Dr. Earl LeRoy Wood, 31 Lincoln Park, Newark.
Place: 91 Lincoln Park South. Time: 8:45 p. m., second Monday of each month.

### Brooklyn Ophthalmological Society

President: Dr. Robert M. Rogers, 680 St. John's Pl., Brooklyn.
Secretary: Dr. William F. C. Steinbugler, 515 Ocean Ave., Brooklyn.
Place: Kings County Medical Society Bldg., 1313 Bedford Ave. Time: Third Thursday of February, April, May, October and December.

### Eastern New York Eye, Ear, Nose and Throat Association

President: Dr. John P. O'Keefe, 251 State St., Albany.
Secretary-Treasurer: Dr. Arthur F. Holding, 142 Washington Ave., Albany.
Time: Third Wednesday of October, November, March, April, May and June.

### Buffalo Ophthalmologic Club

President: Dr. E. E. Blaauw, 190 Ashland Ave., Buffalo.
Secretary-Treasurer: Dr. A. F. Luhr, Medical Arts Bldg., Buffalo.

### New York Academy of Medicine, Section of Ophthalmology

Chairman: Dr. E. F. Krug, 12 W. 44th St., New York.
Secretary: William F. C. Steinbugler, 815 Park Ave., New York.
Time: 8:30 p. m., third Monday of every month from October to May, inclusive.

### Rochester Eye, Ear, Nose and Throat Society

Chairman: Dr. A. Vincent Walker, 833 South Ave., Rochester, N. Y.
Secretary-Treasurer: Dr. John F. Gipner, 53 Fitzhugh St., Rochester, N. Y.
Place: Rochester Medical Assn., 113 Prince St. Time: 8 p. m., third Monday of each month from October to May.

### North Dakota Academy of Ophthalmology and Otolaryngology

President: Dr. George M. Constans, Bismarck.
Secretary-Treasurer: Dr. F. L. Wicks, Valley City.

### Cleveland Academy of Medicine, Section of Ophthalmology and Oto-Laryngology

Chairman: Myron Metzenbaum, Rose Bldg., Cleveland.
Secretary: Dr. A. D. Ruedemans, Euclid and E. 93d St., Cleveland.
Place: Winton Hotel. Time: Fourth Friday of each month.

### Oregon Academy of Ophthalmology and Oto-Laryngology

President: Dr. Joseph L. McCool, 909 Stevens Bldg., Portland.
Secretary-Treasurer: Dr. Andrew J. Browning, 418 Mayer Bldg., Portland.
Place: Good Samaritan Hospital. Time: Third Tuesday of each month.

### The Pittsburgh Ophthalmological Society

President: Dr. Edward B. Heckel, Jenkins Arcade Bldg., Pittsburgh.
Secretary: Dr. George H. Shuman, Park Bldg., Pittsburgh.
Place: Pittsburgh Academy of Medicine Bldg. Time: Fourth Monday of each month, except June, July, August and September.

### The Pittsburgh Slit-Lamp Society

President: Dr. W. W. Blair, 121 University Pl., Pittsburgh.
Secretary: Dr. George H. Shuman, Park Bldg., Pittsburgh.
Place: 121 University Pl. Time: Second Monday evening of every month, except June, July, August and September.

### Pacific Coast Oto-Ophthalmological Society

President: Dr. Arthur Jones, 105 N. 8th St., Boise, Idaho.
Secretary-Treasurer: Dr. Walter F. Hoffman, 817 Summit Ave., Seattle.

### College of Physicians, Philadelphia, Section on Ophthalmology

Chairman: Dr. C. E. G. Shannon, 17th and Walnut Sts., Philadelphia.
Clerk: Dr. Alexander G. Fewell, 1924 Pine St., Philadelphia.
Time: Third Thursday of every month from October to April, inclusive.

### The Rhode Island Ophthalmological and Otological Society

President: Dr. J. E. Raia, 276 Broadway, Providence, R. I.
Secretary: Dr. F. W. Dimmitt, 195 Thayer St., Providence, R. I.
Place: Rhode Island Medical Library. Time: 8:30 p. m., second Thursday in October, December, February and April.

### Southern Medical Association, Section on Eye, Ear, Nose and Throat

Chairman: Dr. William Thornwall Davis, 927 Farragut Sq., Washington, D. C.
Secretary: Dr. Fletcher D. Woodward, Box 162, University, Va.
Place: Miami, Fla. Time: Nov. 20-22, 1929.

### The Memphis Society of Ophthalmology and Oto-Laryngology

Chairman: Each member, in alphabetical order.
Secretary: Dr. R. O. Rychener, Exchange Bldg., Memphis, Tenn.
Place: Eye Clinic of Memphis Eye, Ear, Nose and Throat Hospital. Time: 8 p. m., second Tuesday of each month.

### Nashville Academy of Ophthalmology and Otolaryngology

Chairman: Dr. R. J. Warner, 706 Church St., Nashville, Tenn.
Secretary-Treasurer: Dr. W. W. Wilkerson, Jr., Bennie-Dillon Bldg., Nashville, Tenn.
Place: St. Thomas Hospital. Time: 8 p. m., third Monday of each month.

### Dallas Academy of Ophthalmology and Oto-Laryngology

President: Dr. D. L. Bettison, Medical Arts Bldg., Dallas, Texas.
Executive Secretary: Dr. W. Mood Knowles, Medical Arts Bldg., Dallas, Texas.
Recording Secretary: Dr. L. A. Nelson, 4105 Live Oak, Dallas, Texas.
Place: Dallas Athletic Club. Time: 6 p. m., first Tuesday of each month from October to June. The November, January and March meetings are devoted to clinical work.

### Fort Worth Eye, Ear, Nose and Throat Society

President: Dr. C. P. Schenck, Medical Arts Bldg., Fort Worth, Texas.
Secretary-Treasurer: Dr. R. H. Needham, Fort Worth National Bank Bldg., Fort Worth, Texas.
Place: University Club. Time: 6:30 p. m., first Friday of each month except July and August.

### Houston Academy of Medicine, Eye, Ear, Nose and Throat Section

President: Dr. John H. Foster, 1300 Walker Ave., Houston, Texas.
Secretary: Dr. Edward W. Griffey, Houston Clinic, Houston, Texas.
Place: Medical Arts Bldg., Harris County Medical Society Rooms. Time: 8 p. m., first Thursday of each month from September to June.

### The San Antonio Ophthalmolo-Oto-Laryngological Society

President: Dr. F. H. Roseborough, 302 Moore Bldg., San Antonio, Texas.
Secretary-Treasurer: Dr. William D. Gill, 323 Medical Arts Bldg., San Antonio, Texas.
Place: Bexar County Medical Library. Time: 8 p. m., first Tuesday of each month from October to May.

### Puget Sound Academy of Ophthalmology and Oto-Laryngology

President: Dr. Will Otto Bell, Medical-Dental Bldg., Seattle.
Secretary-Treasurer: Dr. Francis A. Brugman, Medical-Dental Bldg., Seattle.
Time: 8 p. m., third Tuesday of each month, except July and August.

### Utah Ophthalmological Society

President: Dr. F. M. McHugh, 17 Exchange Pl., Salt Lake City.
Secretary-Treasurer: Dr. H. Leroy Smith, Ezra Thompson Bldg., Salt Lake City.

### Virginia Society of Oto-Laryngology and Ophthalmology

President: Dr. H. B. Stone, 303 1st St., S. W., Roanoke.
Secretary-Treasurer: Dr. Fletcher D. Woodward, Box 162, University.

### Spokane Academy of Ophthalmology and Otolaryngology

President: Dr. O. M. Rott, Paulsen Bldg., Spokane, Wash.
Secretary: Dr. C. A. Veasey, Jr., 421 Riverside Ave., Spokane, Wash.

### The Milwaukee Oto-Ophthalmic Society

President: Dr. L. P. Allen, 145½ Main St., Oshkosh, Wis.
Secretary-Treasurer: Dr. Edward R. Ryan, 425 E. Water St., Milwaukee.
Place: University Club. Time: 6:30 p. m., third Tuesday of each month.